

# Do Global Statistics Represent Local Reality and Should They Guide Conservation Policy?: Examples from Costa Rica

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## Abstract

Recent analyses of global population change data have indicated accelerated human population growth near protected area edges in Latin America and Africa. The authors hypothesised that this growth is driven by opportunities created by integrated conservation and development. This paper highlights three Costa Rican protected areas that illuminate the problems inherent with the use of context-independent global statistics. This paper employs grounded, contextual data to suggest that hypotheses derived from global level analyses must be cautiously applied to conservation policy and praxis.

**Keywords:** Costa Rica, conservation, protected areas, migration

## INTRODUCTION

Wittemyer *et al.*'s (2008a) statistical analysis demonstrated accelerated human population growth around protected area (PA) edges in Latin America and Africa and brought attention to the potential role of PAs in attracting migrants to buffer zones. They hypothesise that PA-based economic opportunities and environmental services drive population growth in PA buffer zones due to in-migration. They link these opportunities to significant international funding for 'park-focused integrated conservation and rural development' over the last 20 years. They conclude by saying that this population growth could increase pressure on biodiversity inside and outside PAs. This paper will discuss human migration to the buffer zones of several Costa Rican PAs, all included in the data analysed by Wittemyer *et al.* (2008a), to explore their methods, findings, and hypotheses. Costa Rica is renowned for its exceptional number of PAs, as well as for the tourism that has developed around them (Liverman & Vilas 2006). Thus, an exploration

of the Wittemyer *et al.* (2008a) paper via three Costa Rican PAs is highly relevant.

First this paper summarises the history of Costa Rica's PA system to provide a national-level framework for understanding local contexts. Second, this paper engages three out of the eleven Costa Rican PAs that Wittemyer *et al.* (2008a) used in their analysis: Guanacaste Conservation Area (ACG), Carara National Park (PNC), and Arenal National Park (PNA). The cases demonstrate important critiques and counter examples to Wittemyer *et al.*'s (2008a) paper. Even though the three cases employed here represent less than 1% (3 of 306) of Wittemyer *et al.*'s (2008a) overall analysis, they do illuminate the importance of local, contextual data. Further, data collected from actual migrants to buffer zones provides insight into the roles that parks play in migration.

## METHODS

This study is based on both formal and informal research conducted in Costa Rica. The results presented here are part of a preliminary analysis based upon the following: 1) a literature review analysing Costa Rican PA governance and economic development, 2) questionnaires and interviews implemented in the buffer zones of two PAs, and 3) the author's observations recorded while residing and teaching in Costa Rica from 2006 to 2008.

One week of field research on human migration to PA edges was conducted with migrants to the buffer zones of PNA in

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July 2009, and PNC in December 2009. This pilot research ascertained the factors involved in migrants' decisions to live in communities located within the parks' 10 km buffer zones. The research aimed to determine the role played by the park in migrants' movement to the buffer zone. No field research was conducted to analyse the third case, the ACG.

A questionnaire was implemented with 30 subjects at both PNC and PNA.<sup>1</sup> Participants were asked to assess resource and economic conditions in their current location and in the community from which they had migrated. As well, they were asked to evaluate the importance of the PA in their decision to migrate. Participants were selected by convenience sampling; the author and research assistant approached individuals in public places, implemented the questionnaire, and then asked for names or locations of other migrants. In addition, semi-structured interviews were conducted with new migrants and/or identified leaders of the communities. Semi-structured interviews obtained qualitative data regarding the parks, buffer zone conditions, and drivers of buffer zone population growth. In total, four semi-structured interviews were conducted for PNA and two for PNC.

The three cases chosen here cannot be taken as representative of all PAs in Costa Rica. Indeed, they were chosen precisely because they illuminate potential problems with the findings in Wittemyer *et al.*'s (2008a) article. Furthermore, the author acknowledges that a more formal methodology applied across Costa Rican PAs is necessary. Despite these limitations, the evidence presents important issues.

## THE COSTA RICA CONSERVATION CONTEXT

Costa Rica has a reputation for being a peaceful, democratic, and conservation-minded country (Brockett & Gottfried 2002; Silva 2003). It is highly visible in the environmental literature on Latin America (Young 2005), although its reputation has not gone unquestioned or uncontested (Evans 1999; Campbell 2002; Silva 2003; Vivanco 2006). Costa Rica's reputation is based on relatively forward thinking national policies regarding conservation and tourism. The country's political and economic stability, as well as its significant biodiversity, has attracted international attention and financial assistance to implement conservation (Evans 1999). Yet, it did not always enjoy this reputation, and understanding the historical development of its conservation efforts is essential.

National parks and biological reserves were a significant departure from historical Costa Rican development narratives and strategies. Augelli (1987) overviews Costa Rica's historical development, demonstrating that throughout much of its history, cultural attitudes and government policies actually encouraged deforestation. Costa Rica's isolation and limited economy meant two things: 1) it had a small population in relation to its territory, and 2) governments emphasised internal agricultural production as a path to development (Augelli 1987). Over time, a premium was placed on the conversion of forests from 'non-productive' landscapes to 'productive' agricultural land. This attitude persisted in Costa

Rica until the recent emphases on conservation, tourism, and non-consumptive value reshaped attitudes toward forests (Vivanco 2006).

Government policies that enabled landless *campesinos* (farmers) to acquire land underpinned Costa Rican deforestation. Based on Spanish colonial law, squatters (*precaristas*), could gain official title to frontier lands after ten years, but only if they could demonstrate possession via improvements (Augelli 1987; Brockett & Gottfried 2002). Improvements meant the conversion of forests to agricultural land. In 1941, the government institutionalised a policy of giving possession of up to 300 ha., provided that the occupant had cleared at least one half and maintained at least one head of cattle for every five hectares (Brockett & Gottfried 2002). Thus, popular Costa Rican identity was infused with a 'Frontier Legacy' insisting on the '...existence of a settlement frontier where a surplus population could obtain free or cheap land' (Augelli 1987: 77). These attitudes were exacerbated by government subsidies for cotton, sugar, and beef production for export after World War II (Silva 2003). In the end, deforestation rates hovered in the vicinity of 3.7% in the early 1970s and 1980s, until dropping to less than 1.5% in the early 1990s (Sánchez-Azofeifa *et al.* 2003).

Costa Rican formal conservation efforts were a political strategy designed to stem the rapid deforestation afflicting the country (Boza 1993; Evans 1999; Brockett & Gottfried 2002; Sánchez-Azofeifa *et al.* 2003). Formation of national parks dates back to at least 1955, but earnest legislation and implementation began in the 1970s (Evans 1999; Schelhas & Pfeffer 2005; Robalino & Villalobos-Fiatt 2010). The connection between deforestation and the implementation of national parks is made clear by the fact that the legislation that enabled their creation was the 1969 Forestry Law (Ramírez 2004). Furthermore, the national park service (SPN) was originally housed under the General Forestry Directorate of the Ministry of Agriculture (Evans 1999; Campbell 2002).

Individuals and international conservation organisations were critical to the early development of national parks and wildlife reserves. Mario Boza and Alvaro Ugalde, the first two directors of the SPN were trained at US universities in park management, visited and saw US national parks as an example, and had extensive contacts with US-based conservation organisations (Boza 1993; Evans 1999; Campbell 2002). The first national parks came to fruition with expertise and donations from the World Wildlife Fund, the Nature Conservancy, and Conservation International (Evans 1999; Campbell 2002). These organisations, as well as many bilateral aid agencies, channeled funds to Costa Rica's parks and negotiated pioneering debt for nature swaps to finance their establishment (Evans 1999; Campbell 2002). Boza and Ugalde were also able to convince successive presidents of the importance of parks (Silva 2003).

Costa Rica's early conservation efforts focused on the declaration of national parks and biological reserves that categorically excluded human non-recreational activities (Boza 1993; Evans 1999). In the 1970s, 14 national parks and five

biological reserves were declared, and the 1980s and 1990s witnessed the creation of seven more national parks (Campbell 2002). Between 1974 and 1978 the area covered by national parks and biological reserves expanded from 3% to 12% of the national territory (Sánchez-Azofeifa *et al.* 2003). By the mid-1990s, 11% was national parks and another 13% was biological reserves (Schelhas & Pfeffer 2005).

These forms of absolute protection were a policy response to the extreme deforestation rate and biodiversity loss (Boza 1993; Brockett & Gottfried 2002). Campbell (2002) demonstrates that a narrative emphasising deforestation as a crisis and threat to biodiversity drove Costa Rica's initial conservation efforts. Yet, beginning in the 1990s, Costa Rican conservation policy and practice changed significantly. Absolute protection policies ran up against three limits: 1) very little forested land remained in Costa Rica to be protected and parks were increasingly isolated due to encroachment, 2) the existing parks and biological reserves faced conflicting relationships with communities on their edges, and 3) neoliberal reforms of the Costa Rican state reduced government funding for conservation.

As a result, in the 1990s Costa Rica mimicked international trends by shifting conservation away from absolute protection to forms that integrate with human development, decentralising conservation management, and increasing participatory mechanisms (Hartshorn 2000; Brandon & O'Herron 2004). An important part of this shift was the decentralisation of parks and PA management via the formation of SINAC (*Sistema Nacional de Áreas de Conservación*) in 1996. SINAC, under the administration of the newly founded Ministry of Environment and Energy (MINAEC), decentralised the management of parks into 11 bureaucratic 'conservation areas' (AC) (*Sistema Nacional de Áreas de Conservación* 2009a). ACs were modelled after the UN 'Man and the Biosphere' programme, and the intent was for them to manage their 'core' of national parks and biological reserves, while managing land use in buffer zones around them to prevent encroachment by local communities (Silva 2003). Participatory management was also integrated into the SINAC model via local management councils.

The 1990s also witnessed a further solidification of the links between conservation and tourism as a national strategy for development. Evans (1999) points out that as early as the 1980s, Costa Rica's conservation champions like Mario Boza promoted ecotourism as a way for Costa Rica's national parks to pay for themselves and to make conservation a national priority. Costa Rica's extensive network of PAs was a critical precondition for the ecotourism boom of the 1980s and 1990s (Horton 2009). The Costa Rica Tourism Institute (ICT) further influenced this boom by promoting Costa Rica's *oro verde* (green gold) to grow the nation's tourism industry and earn critically important foreign exchange (Evans 1999). Finally, government policies promoted tourism as a way to reduce threats to PAs by shifting economies away from extractive or ecologically damaging livelihoods (Brandon & O'Herron 2004).

There is much debate whether tourism development in Costa

Rica can be considered 'ecotourism' in the sense that it benefits both parks and their surrounding communities (Honey 1998; Vivanco 2006; Horton 2009). However, there is no doubt that tourism, which is often linked to national park visitation, has become critical to Costa Rica's economy. Estimates of tourism's contribution to Costa Rica's gross domestic product (GDP) range from 13.5%, USD 3,769.2 million (World Travel and Tourism Council 2008), to the more conservative 8% estimated by the national tourism chamber of commerce (Tico Times 2008). In 2006, 1.9 million foreigners visited the country of 4.3 million people (La Nación 2007). Tourism generated an estimated USD 1.85 billion in revenues in 2008 (Tico Times 2008). The travel and tourism economy produced ~258,000 jobs in 2008, 13.1% of total employment, or one in every 7.6 jobs (World Travel and Tourism Council 2008) in the country.

PAs, and 'green' tourism in general, are a critical aspect of this crucial economic driver. This connection has maintained conservation's position in national development plans as well as the national psyche. Yet, it is important to note that the shift to integrated conservation and development via tourism does not subvert the fundamental tenet of absolute protection in the management of Costa Rica's national parks (Evans 1999). The main objective is still the preservation of natural resources *in situ*, which means human settlement and resource use within national parks are strictly prohibited (Robalino & Villalobos-Fiatt 2010). Indeed, even recreation within Costa Rican national parks is extremely limited in comparison to their North American counterparts (Wallace & Smith 1997).

Costa Rica is considered an international leader in biodiversity conservation. Currently, it has 26% of its land and 17% of its coastal waters under some form of conservation, with 28 national parks (Robalino & Villalobos-Fiatt 2010). Costa Rica has at least seven official forms of protection ranging from forms of absolute preservation (national parks and biological reserves) to conservation forms that integrate human livelihoods (wildlife refuges, national monuments, forest reserves, wetlands, and protected zones), as well as a few areas that have been integrated into international forms of protection (peace parks and World Heritage sites).

### THREE CASES

The ensuing analysis will present three cases (two national parks and one conservation area) employed by Wittemyer *et al.* (2008a). First, a preliminary analysis of 30 migrants' to communities in the buffer zones of PNC and PNA indicates that confounding variables make assigning population growth directly to PAs difficult. The PNC and PNA cases also show that migrants' motivations are more complex than implied by Wittemyer *et al.* (2008a).<sup>2</sup> Second, the ACG example shows their methodology for selection of parks to be opaque and uncritical, which reduces the validity of their overall conclusions.

#### Carara National Park

PNC is a small park (5,242 ha.) on the Pacific slope of Costa

Rica that protects a transitional zone between dry and wet forest, and is an important habitat for the Scarlet Macaw (*Ara macao*), other birds, and mammals (Sistema Nacional de Áreas de Conservación 2009b). It was established as a natural reserve in 1978, and was upgraded to national park status in 1998 (Sistema Nacional de Áreas de Conservación 2009b). While a reserve, it suffered from high visitation due to its location along the coastal highway to Jáco; the upgrade to national park status was intended to improve management to protect it from encroaching development and its own popularity (Sistema Nacional de Áreas de Conservación 2009b). PNC remains among the most visited national parks in Costa Rica, in part due to its accessibility and proximity to coastal development from Jáco to Manuel Antonio.

Fieldwork around PNC revealed that population growth via migration has two interrelated poles. One is the small city of Orotina to the north of the park, and the other is the coastal region to the south including the communities of Tárcoles and Quebrada Ganado. Research revealed that PNC itself had little direct effect upon people's decisions to migrate to the area. Instead, population growth in both of these poles is influenced by factors only tangentially related to the park.

According to informants, population growth in Orotina is related to two factors. First, it serves as a bedroom community for people working in San José, Jáco, and Puntarenas due to its location on the main highway connecting San José to the Pacific.<sup>3</sup> Easy access to both the capital city and sources of work—mostly tourism and service work along the coast—was frequently mentioned. Second, the federal government, via the Agricultural Development Institute (IDA), continues to provide land for settlement and agricultural improvement in the area. People in Orotina work in the thriving agricultural sector of the area, primarily in fruit production with a focus on the production of melons.

The community of Tárcoles had relatively few migrants, in part due to the lack of land availability. Tárcoles lies in a narrow strip sandwiched between the ocean and pastures, which are in turn hemmed in by the coastal highway and PNC. Those few migrants identified here worked in tourism and tourism-related activities either in Tárcoles proper, or further to the south. In contrast to Orotina, respondents here did work in jobs directly related to the park, primarily as guides. Tárcoles is the closest community to PNC and is a hub for tours, hotels, and other

services for the park.

Finally, the community of Quebrada Ganado, located a short distance south of the park entrance, grew significantly over the last twenty years. Informants here did not attribute population growth to the park. Instead, they characterised growth as a product of the construction and service work available in resorts to the south. Quebrada Ganado was described as an affordable area located close to work in Jáco and the coastal resorts.

Tourism and resort development—stretching from Playa Herradura, to Manuel Antonio, and punctuated by the explosive growth of Jáco—drives the regional economy. Most resort communities along the coast were created after PNC's establishment, including Punta Leona and Los Sueños. Both of these developments house a mix of temporary and full time residents, catering to wealthy Ticos and foreigners. Punta Leona has several hundred houses, condos and a hotel, and actually lies within the 10 km buffer zone of PNC. Development continues there with a new 36-condo phase selling out in four hours at a price of USD 16.3 million dollars (Business Wire 2007). Further south, Los Sueños includes a 201-room five star hotel, 500 luxury residences, a 200-slip marina, a beach club, and a golf course (Los Sueños 2010). The effect of tourism development is seen in the exaggerated population growth of the canton (county) of Garabito. Overall, Garabito has been growing at a much higher rate (7.5% from 1984 to 2000, and ~6.7% from 2000 to 2015) than the national average (2.8% and 1.6% respectively) (Central American Population Center 2003a).

On the surface, this qualitative data contradicts Wittemyer *et al.*'s (2008a) hypothesised role of parks as drivers of migration. Yet, when migrants were asked to assess economic and environmental conditions on a scale of one to five (1 being much worse, 3 the same, 5 much better) in their current location and in their sending communities, a more complicated reality arose. Respondents indicated that employment, natural resources, forests, and wildlife are all perceived as better in the buffer zone of PNC (Table 1).<sup>4</sup> These average responses support the notion that economic and resource conditions draw migrants.<sup>5</sup> Despite the clear valuation of local conditions as better than in their sending communities, we cannot simply rely upon these numbers to interpret migration to PNC's buffer zone.

**Table 1**

**Opinions of economic and resource conditions of Carara National Park buffer zone migrants (n=30, 18 men, 12 women)**

Question	Prior community	Carara buffer zone community
How would you describe the economic situation?	3.00	3.27
How would you describe the environmental situation/natural resources (quantity & quality)	2.5	3.6
How would you describe the state of the forest?	2.27	3.66
How would you describe the situation in respect to water?	3.53	3.45
Wildlife in the zone?	2.62	3.57

The numbers in this table represent the mean (average) assessment of economic and environmental conditions according to questionnaire respondents. Respondents were asked to assess conditions on a scale of one to five (1 being much worse, 2 worse, 3 the same, 4 better, and 5 much better) in both their prior community and in their current community in the buffer zone of a PA.

First, it is impossible to attribute people's perceptions of economic and resource conditions as explicitly linked to the park itself. The influence of the resort development to the south is strong and makes attribution of migration to the park difficult. Further, these data reflect people's perception of the zone in general, which often includes the development to the south. Second, people did not attribute their migration to the park's existence. When asked to evaluate, 'How much did the existence of the park influence your decision to migrate' (scale of one to three; 1=not at all, 2=some what, 3=very much), the average response was 1.27. This is in spite of the fact that 70% had visited the region, and with 67% stating that they knew of the park prior to migrating. Third, perceptions of ecological conditions in the area cannot be solely attributed to the park because the zone in general is more rural and in better condition than their sending communities. Most of our respondents (21 of 30, 70%) migrated from urban areas (e.g., San José and Puntarenas). Therefore, perceptions of ecological conditions are colored by their urban experience. Fourth, another motivation for migration to the area was the unanticipated theme of personal security. Informants mentioned tranquility and the rural character of the area as influential in their decision to migrate. This too is a strong reflection of the urban background of the majority.

Despite high numbers of visitors, the park's direct economic impact and job creation were a surprisingly weak influence on migration. The park administration, management, and patrolling is conducted by 13 employees. Another seven people are members of a guiding association that provides tours within the park. Finally, Tárcoles has two competing operations with no formal link to the park that offer crocodile tours up the Tárcoles river, which forms the border of PNC. Despite limited direct employment, 63% of those questioned believed that PNC has created more economic opportunities in the area.

PNC appears to refute a simple explanation that buffer zone population growth is a product of infrastructure and opportunities created by the park. Instead, population growth around PNC is driven by opportunities for work in resort communities, tourism development, and agriculture both within and beyond the buffer zone. While migrants to the zone indicated that work opportunities and most ecological conditions are better, only park guides confirmed the park factored strongly in their migration. Instead, most informants indicated that the motivators for migration to the buffer zone of PNC are tranquility, personal security, the area's rural character, and access to employment in coastal development. Clearly, the park plays some role in these conditions, but the link seems less direct than is implied by Wittmyer *et al.*

### **Arenal National Park**

Research in the buffer zone of PNA provides more insight into the attribution of buffer zone population growth to parks. PNA is located in the north-central region of Costa Rica, and is famous for protecting an active volcano. PNA was declared a national park in 1994 after having been a national monument

since the volcano's unanticipated eruption in 1968 (Sistema Nacional de Áreas de Conservación 2009c). The park was significantly expanded in 1992 via a debt-for-nature swap with the Canadian government brokered by the WWF (Isla 2005; Sistema Nacional de Áreas de Conservación 2009c). PNA protects 12,124 ha. and connects to the private conservation areas of Monteverde. The park also prohibits the settlement of the active volcano's slopes to prevent future loss of life and property.

In general, the case of PNA more clearly mirrors the theories of buffer zone population growth put forth by Wittmyer *et al.* (2008a). There is little doubt that the growth of the surrounding communities is linked to the park and the volcano it contains. Field research in PNA's buffer zone was focused in two communities La Fortuna and El Castillo, with the vast majority (83%) of our respondents residing in La Fortuna. La Fortuna, in particular, has seen explosive growth due to its transformation from an isolated, rural community to the pivot of the region's tourism industry. While, El Castillo has seen growth, it remains a small and isolated community, but one in which most of the surrounding land has been purchased by foreigners. Due to the fact that field research in this area focused on La Fortuna, the ensuing discussion will highlight the growth of this community.

Vargas (2003) provides a thorough overview of the significant economic, environmental, and population shifts in La Fortuna over the last 150 years. La Fortuna and the surrounding area was a pioneer agricultural community for the first century of its existence. The area's settlement saw the conversion of forest to pasture and agricultural lands, which was a product of the aforementioned Costa Rican land titling policies (Vargas 2003). Through most of the twentieth century the community grew only slightly, with the 1972 census indicating La Fortuna's population to be 3,710 (Vargas 2003). The eruption of Arenal volcano in 1968 marked a significant turning point because it brought national and international attention to the area. Yet, the area remained rural, isolated, and focused on a traditional agricultural economy of cattle, milk, corn, pineapple, and citrus until the 1980s (Vargas 2003). The 1984 census registered 4,476 people, but the 1990s brought rapid change and growth.

Currently, La Fortuna is the third most visited location by tourists in Costa Rica, and tourism is now the crucial economic driver for the surrounding area (Vargas 2003). La Fortuna's tourism is explicitly linked to the area's natural amenities including the national park, the thermal hot springs, the Arenal Reservoir, and its flora and fauna (Vargas 2003). The last two decades saw significant expansion of tourism infrastructure not only in the community of La Fortuna, but also along the road that runs from La Fortuna to the park entrance and then on to the reservoir (Vargas 2003). The explosion of tourism visitation and infrastructure drove a parallel growth in population. By the 2000 census (10,000 people), the population of La Fortuna more than doubled its 1984 population (Vargas 2003), and it continues to grow.

The growth of La Fortuna is clearly linked to Costa Rica's aggressive pursuit of ecotourism as a development strategy.

Furthermore, La Fortuna's growth is especially notable when compared to the population shifts in its canton (county) of San Carlos. San Carlos grew in total numbers over the last decades, and remained a few tenths of a percentage point higher than the national average from the 1970s to 2000 (Central American Population Center 2003a). However, population growth for the county is expected to be less than the national average between 2000 and 2015 (Central American Population Center 2003a). Indeed, from 1995 to 2000 San Carlos saw the country's 10<sup>th</sup> highest negative net internal migration rate (Central American Population Center 2003b). San Carlos' population trends mirror Costa Rica's general rural to urban migration driven by the declining small-scale agricultural sector. Thus, La Fortuna and PNA buck this trend by drawing migrants from both nearby rural areas as well as Costa Rica's urban centers.

Research with migrants to La Fortuna and El Castillo reaffirmed that the economic conditions provided by the ecotourism industry have drawn them to the region. On average, economic and ecological conditions were seen to be better than in their sending communities (Table 2). Of 30 migrants, 93% had visited the buffer zone before migrating, and 83% knew about the park prior to moving. Further, 80% believed that the park had created more economic opportunities. However, when asked to rank how much the park's existence influenced their decision (scale of one to three; 1=not at all, 2=somewhat, 3=very much), the average response in the PNA case was only 1.31. Thus, our respondents certainly took economic conditions and opportunities of the area into account, but again these opportunities may not be explicitly linked to the park.

In terms of direct employment, on one level the case of PNA is very similar to that of PNC. The park's manager indicated that PNA currently operates with 11 employees. Thus, direct employment by the park is minimal. However, in contrast to PNC, La Fortuna is littered with small travel agencies and operators. These operators offer tours to many of the area's natural attractions including guided park trips, hot springs tours, zip line and canopy tours, and hikes in private holdings both within and around the park. A key element of many of these tours is an evening view of PNA's active lava flows. In addition, many people of La Fortuna work in hotels and restaurants that explicitly market their views of and/or proximity to the volcano and the park. Thus, the secondary employment directly linked to the park seems greater in the case of PNA than PNC.

A view of the volcano and its active eruptions is a key selling point of PNA and La Fortuna as a destination. This fact affects the ability to attribute increased human population in PNA's buffer zone to the park's existence. Indeed, during this research several informants argued that that PNA's park status factors very little in migration decisions. Instead, informants insisted that the real draw for both tourists and migrants is the volcano and that the area would have grown even, perhaps even more so, without a park. Strikingly, 87% (26 of 30) answered 'no' when questioned whether 'there would have been the same number of economic opportunities here if there was no volcano?' Thus, they believed that if the park had been established in the same place, but without the volcano, the tourism and the area's growth would have been minimal.

The PNA case clearly reflects the causal mechanisms of population growth hypothesised by Wittemyer *et al.* (2008a). However, this case reiterates the fact that local contextual factors, in this case a volcano, make it difficult to attribute population growth solely to migrants' perceptions of economic opportunities created by the park itself. Many people in La Fortuna and El Castillo consciously migrated for the economic opportunities that revolve around exploiting the park and its surrounding environs via tourism. However, very few of them indicate that the park itself ('*como tal*') drives opportunity around PNA.

### Guanacaste Conservation Area

The third case that raises important questions regarding the validity of Wittemyer *et al.*'s (2008a) results is that of the ACG. The inclusion of the ACG in their analysis is problematic because the ACG cannot be considered a single park with a buffer zone.

The ACG is one of the 11 bureaucratic regions of the previously discussed SINAC. Again, a 'conservation area' is a geographic region with a corresponding decentralised management structure to manage PA and non-PAs resources. The ACG consists of 120,000 terrestrial ha. and 70,000 marine ha. Its primary purpose is to restore the tropical dry forest ecosystem, along with the adjacent rainforests, cloud forests and marine systems (Area de Conservacion Guanacaste 1997). The ACG protects the second largest dry tropical forest in the world (IUCN 1999; Janzen 2000). 60% of all species present in Costa Rica can be found in the ACG, representing

**Table 2**  
**Opinions of economic and resource conditions of Arenal National Park buffer zone migrants (n=30, 15 men, 15 women)**

Question	Prior community	Arenal buffer zone community
How would you describe the economic situation?	3.17	3.64
How would you describe the environmental situation/natural resources (quantity & quality)	2.89	3.97
How would you describe the state of the forest?	2.74	4.03
How would you describe the situation in respect to water?	3.30	3.97
Wildlife in the zone?	2.68	3.83

The numbers in this table represent the mean (average) assessment of economic and environmental conditions according to questionnaire respondents. Respondents were asked to assess conditions on a scale of one to five (1 being much worse, 2 worse, 3 the same, 4 better, and 5 much better) in both their prior community and in their current community in the buffer zone of a PA.

2.4% of global biodiversity (IUCN 1999). Within the ACG's administrative area there are several different types of PAs including national parks, wildlife refuges, and an ecological experiment station. In 1999, the entire ACG was established as a World Heritage Site.

On the surface, Wittemyer *et al.*'s (2008a) use of ACG seems appropriate since much of the area is protected. However, it is problematic because Wittemyer *et al.* (2008a, b) are not clear regarding their analysis of the borders of ACG and what the corresponding buffer zone would be. The ACG consists of PAs at different levels of protection, from IUCN categories I and II all the way to V and VI. This is important because Wittemyer *et al.* indicate in their supplementary materials (2008b) that they only include category I and II PAs. This raises questions about how they determined the 10 km buffer zones for the ACG. Did they create a buffer zone around each of the category I and II units found within the ACG? Or did they measure growth outside the borders of the entire ACG?

If Wittemyer *et al.* (2008a) chose to use the entire ACG rather than the individual PA borders, then there may be confounding factors that affect their results. It is important to reiterate that the ACG includes agricultural land and communities that are technically under, but in many ways outside, the management regime of ACG. The supplementary materials provide no insight into Wittemyer *et al.*'s (2008a, b) decisions regarding how to deal with the complexity of the ACG. The lack of clarity in this case has importance when we consider the fact that the ACG engulfs existing population centers like the burgeoning town of Liberia.

## DISCUSSION

The three cases presented here provide preliminary indications of important anomalies in the Costa Rican case. Data collected from migrants to the buffer zones of PNC and PNA, while limited in explanatory power due to the small sample size, do indicate some trends of import. First, economic opportunities around PAs are important factors in drawing migrants, but contextual analysis suggests a much more complicated situation. Second, while employment opportunities are critical in migrants' decisions, in Costa Rica direct employment by PAs plays a much smaller role than suggested. Lastly, the Costa Rica case, and ACG in particular, raises serious questions regarding the process and representativeness of Wittemyer *et al.*'s sampling procedure.

This research suggests that Wittemyer *et al.*'s (2008a) analysis is at least partly true in that economic opportunities motivate migrants. However, both PNC and PNA indicate that population growth can be complicated by other factors that are tangential to the park's existence. PNC highlights that migrants did move for employment conditions, but that these jobs and population growth were a product of coastal development not PNC itself. PNA, on the other hand, closely emulates their suggested model of population growth spurred by the conservation-tourism nexus. However, informants around PNA insisted that the volcano would have drawn tourism and

jobs even without the park. Further, it is important to note that the growth of jobs related to parks does not occur evenly across landscapes. Robalino & Villalobos-Fiatt (2010) show that PA-based employment and wage effects concentrate near park entrances, but not further away.

The Costa Rican cases also demonstrate a rather small role played by direct employment at the PAs. The small number of jobs produced by PAs is directly related to the management goals of Costa Rican national parks. National park management there seems to intentionally limit the interaction between tourism and park biodiversity. Recall that Costa Rica's national parks are managed primarily for the protection of biodiversity and only secondarily as a site of recreation. Thus, they have very limited recreational infrastructure. Second, since SINAC's development, along with the decentralisation of PA management and budgets, Costa Rican parks have suffered from severe underfunding. In the case of PNC, funds are so limited that the guiding association has paid out of the group's funds for basic services, e.g., cleaning of the park bathrooms.

Lastly, there are significant questions regarding the sampling procedure utilised by Wittemyer *et al.* (2008a, b) and therefore, their conclusions. First, the usage of the ACG is problematic because it demonstrates a lack of understanding of the bureaucratic nomenclature employed. This could lead to significant bias not only in their analysis of Costa Rica, but throughout their sample. Second, their overall sample of Costa Rican PAs raises some doubts. Their sample includes 11 Costa Rican PAs, of which seven are national parks and two are biological reserves (Wittemyer *et al.* 2008b).<sup>6</sup> As previously noted, Costa Rican national parks and biological reserves are forms of absolute protection and are managed to prevent excessive visitation with the exception of few PAs (i.e., Poas Volcano, Manuel Antonio). Furthermore, national parks and biological reserves are not examples of integrated conservation and development policies. Only two parks in their Costa Rica sample would fit this description, those being the ACG and La Amistad International Peace Park. Both of these are World Heritage sites with management plans integrating core PAs and buffer zone economic development.

The findings presented here also have important theoretical implications beyond the Wittemyer *et al.* (2008a) paper. In particular, the results complicate Scholte & de Groot's (2010) three suggested models for the interactions between PAs and human migration: frontier engulfment, attraction, and incidental. Scholte & de Groot rightly critique Wittemyer *et al.*'s (2008a) reliance upon the attraction model to explain population growth on PA edges. The attraction model can be seen as a 'pull' model by proposing that migrants are attracted to PA edges due to park and tourism jobs, or because of access to resources within PAs. The other suggested models attempt to characterise alternatives to the attraction model. Frontier engulfment is when 'a PA established in a still-intact, often remote area is later engulfed by an extraction frontier (e.g., logging) and subsequently by an agricultural (e.g., cattle, cropping) frontier...' (Scholte & de Groot 2010: 631). They suggest that poor economic and resource conditions in

migrants' home communities, or 'push' factors, characterise frontier engulfment. Finally, they propose the incidental model for those factors that don't 'fit in a push-and-pull categorisation' (Scholte & de Groot 2010: 631). Examples they provide for the incidental model include conflict and disaster, as well as forced resettlement due to PA creation. In all of the incidental cases, forces external to the PA drive migration.

Scholte & de Groot (2010) suggest utilising their three models to re-analyse Wittemyer *et al.*'s (2008a) sample for a more refined analysis of the interaction between human migration and PAs. However, the Costa Rican cases presented here do not fit neatly into the typology they have devised. PNA, as was already suggested, closely adheres to the attraction model, but a more detailed analysis points out that migrants themselves do not explicitly recognise the role of the park. PNC would technically fit into their incidental model, but not via the mechanisms that they suggest. PNC points out the limitations of their typology as currently constructed, in that incidental mechanisms are not necessarily due to uncontrolled natural or human events (i.e., disasters or conflict).

The Costa Rican cases support Scholte & de Groot's (2010) recognition that effective and ethical conservation is more likely if PA managers develop strategies based on the conditions at particular PAs. Yet, it is doubtful that lumping such hugely divergent situations within the category of incidental will enable PA managers to adequately understand and deal with immigration to PA edges. Coping with population growth due to conflict or disasters is very different than growth due to economic opportunities nearby, as was indicated in the PNC case. Thus, the typology proposed by Scholte & de Groot, while potentially useful, needs further refinement.

## CONCLUSION

In conclusion, the Wittemyer *et al.* (2008a) paper raises an important issue, but its hypotheses are not fully supported by the initial research discussed here. Their analysis is compelling because it matches a 'story' that seems visible around PAs worldwide. This 'story' suggests that migrants are attracted to the new opportunities created by PAs, and that population growth threatens biodiversity. Indeed, sites in Costa Rica (i.e., Monteverde) have suffered from excessive development driven by PA-derived opportunity (Weinberg *et al.* 2002; Vivanco 2006). Wittemyer *et al.* (2008a) do call for further research to test their hypotheses. Yet, the problem is that despite this call for contextualisation, many have taken their hypotheses to be the 'truth' and are basing both theory and praxis on them (Igoe 2009; Hoffman *et al.* this issue;).

Thus, we must develop a research programme that contextualises the relationship between PAs and population growth. Accurate analyses are needed to provide a sound basis for conservation policy makers at the local, national, and global levels. Indeed, the data presented on these Costa Rican cases indicate other factors, and highlight why a more nuanced analysis is needed. As is the case with all studies interested in the nexus between the environment and migration, it is critical

that we understand the household level decisions being made throughout the entirety of the system, in both the sending and the receiving communities (Bilsborrow 2002; Carr 2008).

Similar to Igoe's (2006) call for systematic analysis of community-based conservation's impacts, the role of PAs in migration must be unearthed at each location. Further, many anthropologists have already stressed that the benefits of PAs are not equally distributed (Igoe 2006; West *et al.* 2006). Thus, we must be particularly attentive to the contours, variation, and complexity involved in human migration to buffer zones. Finally, it is essential that confounding factors are identified and controlled for, and that localised analyses be based on accurate understanding of local nomenclature. This paper highlights the explanatory limits of global-level statistical analyses for measuring the links between PAs and population growth in buffer areas. Knowledge of local, contextual conditions can bring to our attention these limits, and they mandate that we use caution when applying such statistical analyses to guide conservation policy and procedures.

## Notes

1. A sample size of 30 migrant questionnaires was chosen for each of the parks' buffer zones because this number facilitates more statistical testing. In general, a sample size equal to or greater than 30 is considered sufficient to approximate a population's normal distribution and standard deviation (StatSoft, Inc. 2010). Thirty was also chosen because it was a number of questionnaires that was feasible for the author and one research assistant to implement. The author's preliminary research grant provided funds for just over one week of research time at each park. Thirty respondents represents an unknown percentage of the population of migrants in each of the communities; therefore, conclusions reached via this exploratory research are limited in their explanatory power and are best considered as indicative, not representative or significant.
2. It is critical to recognise that a sample of 30 migrants recruited via convenience sampling is unlikely to produce a representative sample. Thus, all conclusions presented about PNC and PNA must be understood as indicative and preliminary, not conclusive.
3. A bedroom community is a community where much of the workforce commutes on a daily basis to a separate location or community where their work is located. Synonyms for bedroom community include 'bedroom suburb' and 'dormitory town.'
4. Interestingly, water resources were qualified as poorer. Research time did not enable follow up on this question, but it is widely known that the Tárcoles river is highly polluted. This knowledge may have colored people's perceptions, but definitive answers to this question will be pursued in later research.
5. Statistical significance of this difference is yet to be tested.
6. Costa Rican PAs included in their analysis are: Area de Conservación Guanacaste Costa Rica, Arenal National Park, Barbilla National Park, Barra Honda National Park, Carara National Park, Chirripó National Park, Hitoy-Cerere Biological Reserve, Lomas de Barbudal Biological Reserve, Talamanca Range-La Amistad National Park/Reserve Costa Rica World Heritage Site, Volcán Irazú National Park, Volcán Poás National Park.

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