



UNDERSTANDING THE LINK BETWEEN BENEFITS FROM PROTECTED AREAS AND THEIR RELATIONSHIP WITH SURROUNDING COMMUNITIES: AN EXPLORATION IN COSTA RICA

Sergio A. Molina-Murillo^{1,2,*}, Mauricio Fernández Otárola³ and Kelly N. Shreeve⁴

*Corresponding author: sergiomolina@una.cr

¹ Department of Environmental Sciences, National University of Costa Rica (UNA), Heredia, Costa Rica

² Forest Research Unit (ReForesta), University of Costa Rica, San Jose Costa Rica

³ Department of Biology, University of Costa Rica, San Jose, Costa Rica

⁴ Department of Sociology, Colorado State University, USA

ABSTRACT

Protected areas are an essential strategy in preserving natural resources. A central aspect of protected area management is to maintain and improve their relationship with surrounding communities given that local conflicts often occur over the existence or expansion of protected areas due to land-use restrictions. This study seeks to understand the link between perceived socioeconomic and environmental benefits from protected areas and the perceived strength of the relationship between 12 of these communities and their corresponding protected areas in Costa Rica. In total, 365 door-to-door interviews were conducted to collect data, and a logistic model and correlations were used to analyse the results. We found there is a significant link between the strength of the relationship between the community and protected area and the number of perceived socioeconomic benefits from the protected area; however, such a link does not exist with environmental benefits. This finding suggests that policy makers and protected area managers need to better develop and explain, in a participatory and integrated fashion, socioeconomic benefits from protected areas to communities since the successful long-term management and survival of protected areas hinges on these relationships. In this way, the desired goals of preserving habitats and biodiversity can be supported.

Key words: communities, Costa Rica, ecosystem services, environmental benefits, protected areas, socioeconomic benefits

INTRODUCTION

Significant efforts since the beginning of the 19th century have helped increase exponentially the number of protected areas to become a central component of biodiversity conservation across the world (Chape et al., 2008); covering 15.4 per cent of the planet's terrestrial and inland water areas by 2014 (Deguignet et al., 2014, p.12). However biodiversity is still threatened. A key underlying cause of biodiversity loss is the lack of awareness of its value as conceptualized in the Aichi Biodiversity Strategic Goal A (Convention on Biological Diversity Aichi 2020 Biodiversity Targets, n.d.), The Economics of Ecosystems and Biodiversity Initiative (TEEB, 2010), and the recently adopted Sustainable Development Goal 15 to halt biodiversity loss (United Nations Sustainable Development Goals, 2015).

conserving biodiversity (Bruner et al., 2001; Secretariat of the Convention on Biological Diversity, 2010), and contribute to local communities by providing ecosystem services and sustaining cultural values as well (IUCN, 2012; Marshall & Simpson 2008; Muhamad et al., 2014; Naughton-Treves et al., 2005; Olomí-Solà et al., 2012). However, even when the valuation of biodiversity conservation might help local communities reduce their direct pressures on natural resources, as noted in Aichi Biodiversity Strategic Goal B (Convention on Biological Diversity Aichi 2020 Biodiversity Targets, n.d.), many protected areas struggle in maintaining and improving their relationship with communities given resource and land-use restrictions, unequal benefit sharing, and equivocal governance approaches (e.g., McCool et al., 2012; Nana & Tchamadeu, 2014; Snyman, 2012).

Protected areas are vital in addressing climate change (e.g., UNFCCC, 2007), are effective implements for

Understanding the relationship between protected areas and their surrounding communities is critical for

successful long-term management and conservation of natural ecosystems (Andam et al., 2010; Khan & Bhagwat, 2010; Timko & Satterfield, 2008). For a community to maximize potential benefits provided by the protected area and for the protected areas management to work effectively with the community on conservation outcomes, there must be a thorough understanding from both entities of the current status of relationships, how this can be mutually beneficial, and options for improving affiliations. Although it is commonly conceived that the only purpose of protected areas is to conserve the natural landscape and its biodiversity, today the importance that protected areas have in promoting public understanding and fostering the socioeconomic wellbeing of their respective local communities is recognized (Marshall & Simpson, 2008; Muhamad et al., 2014; Naughton-Treves et al., 2005). Achana and O'Leary (2000) argue that in addition to an ecological relationship between protected areas and neighbouring human communities, strong social relationships have proven to be mutually beneficial. If local people benefit from the existence of a protected area, they will support the protected area and the continued conservation of the area (Mackenzie, 2012; Nyirenda & Nkhata, 2013). This, in turn, may lead to the progress of a community and supports the protection of biodiversity (Chandra & Idrisova, 2011).

Some studies have found negative implications of protected areas on surrounding communities, leading to negative community–protected area relationships. Factors such as management strategies, community organization, and distribution of benefits can advance these negative relationships (Feng, 2008; Raboanarielina, 2012). However, other studies have found that protected areas have positive effects on nearby communities, and these positive impacts appear to be related to strengthened relationships with the respective protected areas (e.g., Mackenzie, 2012; Tessema et al., 2010). Additional studies have pointed to community members who perceive benefits from wildlife (Karanth & Nepal, 2012) and/or tourism, have more positive attitudes toward conservation (Sirakaya et al., 2002; Snyman, 2012).

In Costa Rica there are over 60 protected areas covering approximately 26 per cent of inland territory, created to conserve the area for its natural, cultural, or socioeconomic value (SINAC, n.d.). This study aimed to analyse communities' perceptions of *environmental* and *socioeconomic* benefits (values) provided directly or indirectly by nearby protected areas in order to suggest ways in which to strengthen the relationship. The study assessed the link between perceived benefits of protected

areas by community members and the strength of the community–protected area relationship.

METHODOLOGY

The project centred on assessing the perceptions of locals about ecosystem services and their relation with their surrounding protected area. Since the way individuals see the world is inherent to their behaviour in social systems (Veenhoven, 2002), measuring perceptions of locals is relevant to understanding the relationship between communities and protected areas. There is an important body of literature that examines actual objective characteristics with perceptions (e.g. Flynn et al., 2006; Li et al., 2011; Marsh & Tilley, 2010). Such studies indicate that measures of perceptions inform policy in ways that solely objective measures cannot, since the way individuals see the world – as opposed to the way the world actually is – is itself primary to the behaviour of social systems.

• Study site

The focus was on the four most visited protected areas in the Central Volcanic Conservation Area of Costa Rica: Poas Volcano National Park (Poas), Braulio Carrillo National Park (Braulio Carrillo), Irazu Volcano National Park (Irazu), and Guayabo National Monument (Guayabo). In terms of total number of visitors, official data for the year 2012 report Poas as the most visited area studied with 299,102 visitors, Irazu was second with 173,702 visitors, Guayabo with 27,100, and Braulio Carrillo received the fewest with 14,305¹. Three gateway communities were selected for each of the four protected areas based on their proximity to one of its public entrances (Figure 1). These communities are characterized by being rural, relying mostly on agriculture, forestry and cattle ranching for their key economic activities and, given their proximity to the protected area, also taking advantage of tourism opportunities.

• Data collection and analysis

In total, 365 interviews were conducted in these communities between November 2011 and April 2013 (see Table 1). After a pilot test, the twelve chosen communities were sampled using a door-to-door systematic sampling procedure within spatial strata in which a pair of interviewers approached every other house in each community. Interviews were conducted with an adult of the household. All interviews were collected in a voluntary and confidential manner in order to preserve the internal validity of our findings considering the small number of households in each community; with a resultant sampling error for each of them smaller than twenty per cent.

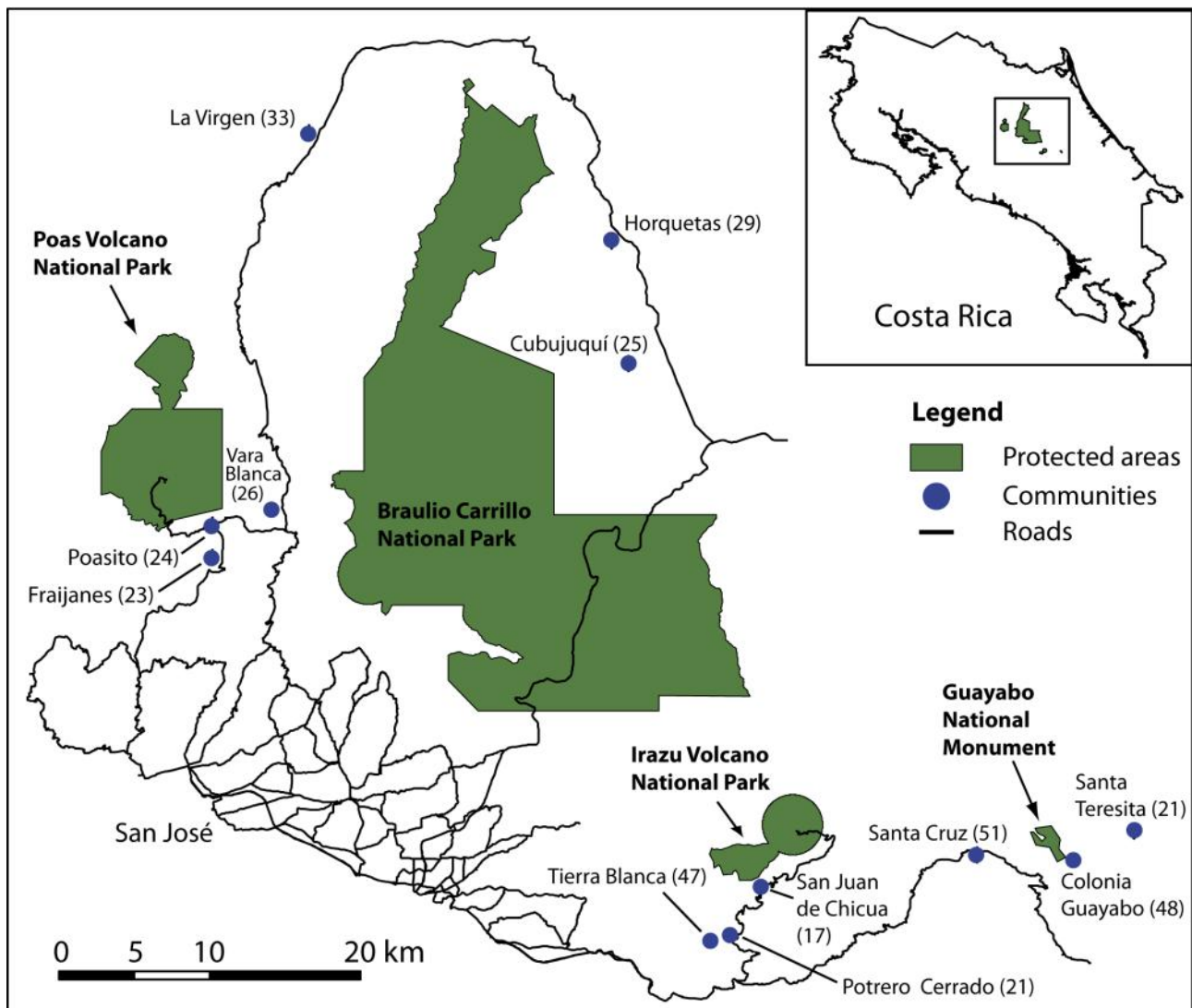


Figure 1. Location of protected areas and communities assessed (in parentheses the number of interviews conducted per community)

Respondents were asked to consider 13 possible benefits (see Table 3) obtained from their respective protected area and respond 'yes' or 'no' to whether they perceived that their community receives each benefit. Included in the list were five possible environmental benefits (i.e., those legally recognized in Costa Rica to receive payments for ecosystem services) and eight socioeconomic benefits – based on feedback from park officials and on previous studies (e.g., ACCVC/UNA-IDESP, 2011; Gutierrez & Siles, 2008). In subsequent analyses the number of *environmental* and *socioeconomic* benefits were compared; however, since the number of benefits on each category varies, we weighted the number of responses to control for this initial difference. Respondents were also asked to rate the perceived strength of the relationship between the community and their respective protected area. This was assessed with a three-point ordinal scale from one being 'Weak' to three being 'Strong'; and those respondents who chose the option 'two' were excluded from the

analyses since they do not have any attitude in either direction. Logistic models were used to assess the probability for *environmental* and *socioeconomic* benefits to be identified by local inhabitants when considering the perceived strength of the relationship between the protected area and the community. In order to account for the effects of the communities in our logistic model, we nested each of the three communities into each of their corresponding protected area. Statistical analyses were carried out using JMP 10 (SAS Institute, 2012).

RESULTS

• Sample profile

Of those interviewed, there was a similar sample size of community members interviewed across the four protected areas and across their place of origin in or outside the respective community (Figure 1 and Table 2). Since most interviews were conducted during the day, over a third of interviewees were housewives. Most

Table 1. General description of the studied communities and sampling effort, a total of 365 houses across twelve communities

Community	Protected Area	Number of Houses	Number of Interviews	Interviewing Period
Fraijanes	Poas	393	23	November 2011
Poasito		366	24	
Vara Blanca		160	26	
La Virgen	Braulio Carrillo	718	33	April 2012
Horquetas		616	29	
Cubujuqui		354	25	
Tierra Blanca	Irazu	667	47	November 2012
Potrero Cerrado		146	21	
San Juan de Chicua		83	17	
Santa Cruz	Guayabo	253	51	April 2013
Santa Teresita		156	21	
Colonia Guayabo		138	48	

Table 2. Demographic description of sampled respondents (n=365)

Variable	Category level	n (%)
Protected Area	Poas Volcano National Park	73 (20)
	Irazu Volcano National Park	85 (23.3)
	Guayabo National Monument	120 (32.9)
	Braulio Carrillo National Park	87 (23.8)
Origin	Born in the area	184 (50.4)
	Came from outside	181 (49.6)
Gender	Female	231 (63.3)
	Male	134 (36.7)
Age	<20	16 (4.4)
	21-40	124 (34)
	41-60	161 (44.1)
	61-80	58 (15.9)
	>80	6 (1.6)
Education	Elementary incomplete	52 (14.3)
	Elementary complete	159 (43.7)
	High school incomplete	41 (11.3)
	High school complete	48 (13.2)
	University incomplete	22 (6)
	University complete	42 (11.5)
Occupation	Housewife	142 (39.4)
	Primary sector (e.g., agriculture, dairy)	37 (10.3)
	Secondary sector (e.g., construction, industry)	12 (3.3)
	Tertiary sector (e.g., services, tourism)	106 (29.4)
	Other (e.g., student, retired, unemployed)	63 (17.5)

respondents (94 per cent) were between 21-60 years old, and only about 15 per cent did not complete primary

- **Environmental and socioeconomic benefits**

On average, locals perceive more *environmental* benefits (76.92 per cent) than *socioeconomic* benefits (54.28 per cent) from their respective protected areas (Wilcoxon $Z = -10.17$, $df = 1$, $P = 0.001$). *Increases in overall landscape*

beauty and the *protection of biodiversity* are recognized by more than 80 per cent of locals as key environmental benefits provided by their surrounding protected area. Under the socioeconomic dimension, the two most recognized benefits provided by protected areas are that they provide *surrounding properties with higher value* and they *help increase economic opportunities through tourism*. As shown in Table 3, even these top

Table 3. Percentage of respondents who perceive *environmental* and *socioeconomic* benefits are provided by their surrounding protected area

List of perceived benefits	Percentage
Environmental	
Increases overall landscape beauty	89.04
Protects plants and animals in general (biodiversity)	83.84
Protects soil from erosion	72.05
Helps purify the air and sequester carbon	71.23
Generates and protects water	67.95
<i>Environmental average</i>	<i>76.82</i>
Socioeconomic	
Gives higher value to surrounding properties	68.77
Increases economic opportunities due to tourism	62.19
Provides spaces for recreation	57.81
Park rangers provide surveillance and alerts in case of emergencies	56.99
Park administration supports development of infrastructure	52.60
Generates sources of employment	51.23
Collaborates in community development activities	46.30
Helps community improve public services	38.36
<i>Socioeconomic average</i>	<i>54.28</i>

Table 4. Logistic model explaining individuals' perceived relationship with the protected area

Independent variables *	DF	χ^2	P
Environmental benefits	1	0.165	0.685
Socioeconomic benefits	1	38.08	<0.001
Protected area	3	13.08	0.004
Community (within its protected area)	8	16.42	0.037
Model $\chi^2 = 80.53$, $P < 0.001$ R^2 (U) = 0.235, N = 247			

* The dependent variable is the relationship perceived by each individual with the protected area, coded 0 = weak and 1 = strong

socioeconomic benefits lag behind when compared with environmental ones.

There is a positive link between the perception of *socioeconomic* benefits and the perceived strength of the community–protected area relationship; however, such relationship is not present for *environmental* benefits (Table 4). As shown in Figure 2 (overleaf), those who consider there is a weak relationship between the community and the protected area perceive on average 73 per cent of the potential *environmental* benefits, but these same individuals only perceive receiving around 40 per cent of the potential *socioeconomic* benefits. Note that at 95 per cent confidence level, the percentage of *environmental* benefits identified does not significantly change for those respondents who perceive a stronger relationship with the protected area; whereas, the percentage of *socioeconomic* benefits increases from 39.7 to 67.1 with a stronger community–protected area relationship.

The community–protected area relationship is also influenced according to the protected area and the communities associated with the protected areas (Table 4). A clear pattern indicates that *environmental* benefits significantly surpass the perceived *socioeconomic* benefits within each of the protected areas (Figure 3). However, the most visited protected areas (i.e., Irazu and Poas) are the ones where the smallest gap exists between *environmental* and *socioeconomic* benefits. Braulio Carrillo is the protected area where *environmental* benefits are perceived to be the highest, significantly different from Guayabo and Poas, although it is also the area with the largest gap between these and *socioeconomic* benefits.

In the case of Irazu and Braulio Carrillo, almost twice as many nationals as foreigners visited the protected areas. In contrast, Poas was visited evenly by foreigners and nationals. Since the protected areas do not keep records of adjacent visitors, we asked the locals about their

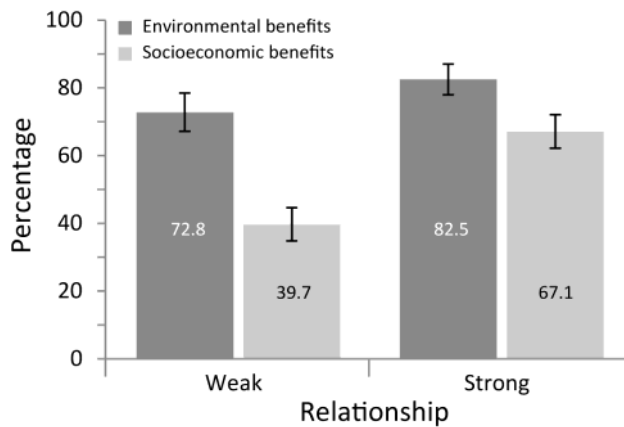


Figure 2. Percentage of respondents who perceive environmental and socioeconomic benefits across the perceived relationship with the protected area (Error bars indicate 95 per cent confidence interval)

visitation to the nearby protected areas and found that those around Poas tend to visit the most frequently (93.1 per cent). Irazu was the second most visited protected area by 85.7 per cent, Guayabo closely follows with 82.5 per cent, and Braulio Carrillo had very low visitation by their neighbours with only 29.8 per cent. We found no correlation between these visitation patterns and a community–protected area relationship (Spearman $\rho = -0.058$, $P = 0.272$). The effects assessed in this study across other variables such as gender, education, origin, or age did not present significant differences.

DISCUSSION

Our results show evidence for a link between the number of perceived *socioeconomic* benefits a community receives and the perceived strength of the relationship between that community and the respective protected area. This concurs with the results found by Allendorf et al. (2012), Baker et al. (2012), and Pearson and Muchunguzi (2011). As presented in Figure 2, it seems that *environmental* benefits are a necessary condition in the community–protected area relationship due to their reliance on natural resources for their living or employment. Despite the general awareness of the *environmental* benefits provided by their surrounding protected areas, it appears that locals may be unaware of how these benefits directly benefit them. Therefore, they do not see higher environmental benefits as relating to a stronger relationship. *Socioeconomic* benefits, or lack thereof, may more directly affect individuals, thus, one could argue that it is easier for people to draw these connections. This idea is supported by the fact that people do not truly understand or value *environmental* services until they have been purposefully taught about them. According to Stern et al. (2008), people's value of *environmental* services increases after having received some environmental education; however, once the

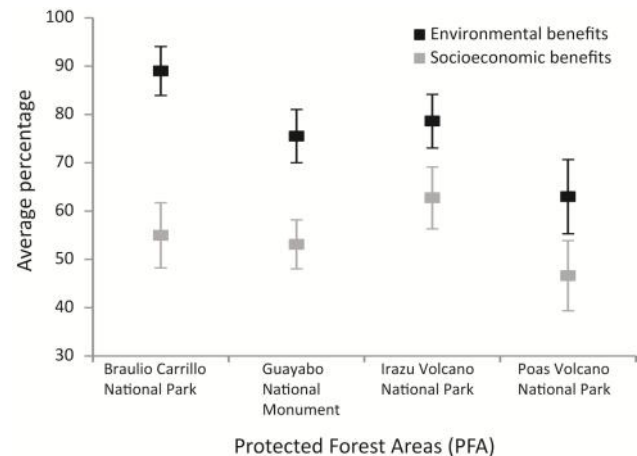


Figure 3. Percentage of respondents who perceive environmental and socioeconomic benefits across protected areas. Error bars indicate 95 per cent confidence interval.

education stops, their perceptions return to how they were before.

When results are analyzed for *environmental* and *socioeconomic* benefits across each protected area, the patterns remained similar with a higher average of *environmental* benefits identified (Figure 3). These along with other results from studies in Asia and Africa (Allendorf et al., 2012; Allendorf & Yang, 2013; Pearson & Muchunguzi, 2011) lead us to believe that this pattern on the perception of benefits is not an isolated case but holds across regions.

Despite being the most visited protected area, respondents at Poas indicated the lowest average percentage of both *environmental* and *socioeconomic* benefits. Here, and in Irazu, the two most visited protected areas by tourists, is also where the gap between *environmental* and *socioeconomic* benefits is the smallest. The focus on tourism might be limiting the awareness and understanding of additional benefits provided by the nearby protected area; furthermore, in these highly visited protected areas tour-operators or out-of-town accommodation owners often are the ones controlling – or at least mediating – most tourism activities. On the contrary, an area such as Braulio Carrillo with little visitation is still highly perceived – contrary to the other protected areas – as an important source of both *environmental* and *socioeconomic* benefits by locals.

West et al. (2006) argue that conservation efforts change how people see themselves in relation to their surroundings. Considering this, a current discussion in the scientific community questions whether or not protected areas have an effect on surrounding communities. On one hand, the preservation of land may



The protection of vast pristine forests at Braulio Carrillo National Park is paramount to provide potable water to an increasing urban population in the capital city of San Jose © Sergio A. Molina-Murillo

reduce the use of natural resources and limit agricultural expansion, but on the other hand, protected areas present opportunities to preserve ecosystem services and boost tourism revenue (Andam et al., 2010; Otuokon et al., 2012; Park et al., 2012). If local governance is lacking, and by extension community participation, then residents may lose the opportunity to reap the *socioeconomic* benefits that a relationship with the protected area can offer (Aigner et al., 2001; Molina-Murillo & Clifton, 2014). Other factors such as organizational structure, leadership, and political participation are also important to realize these benefits (Adams & Hutton, 2007; Laverack, 2001). Therefore, better organized communities are more inclined to work together and take advantage of the benefits provided by their surrounding protected areas (Bodin & Crona, 2008; Rydin & Pennington, 2000). The reason is simple: they have the necessary leadership and connectedness to successfully do so (Bodin & Crona, 2008). In addition, better organized communities are also at greater advantage for protecting and developing their natural capital (Pretty, 2003; Pretty & Ward, 2001). This is because communities that are characterized with high social capital facilitate better sharing of ideas, skills, and beliefs (Pretty & Ward, 2001) as well as a greater sense of working together to achieve common goals such as conservation and development.

Certainly the establishment of the Costa Rican network of protected areas along with the growth of the tourism economy have altered the lifestyles, demographics, and sources of income in communities around the country (Schelhas & Pfeffer, 2005). Although substantially poorer than other communities in the country, there is evidence

that protected areas in Costa Rica seem to alleviate poverty for their surrounding communities (Andam et al., 2010). Therefore, a close evaluation of these developments must be performed on a continual basis, so that protected areas and their surrounding communities are managed as integrated units for conservation and development.

CONCLUSIONS

Despite the increasing awareness that local people living around protected areas might have about the benefits provided by these ecosystems, having and maintaining a close relationship between communities and the protected area is central to this perception and consequentially, to the long-term existence and effectiveness of the latter. Residents are more aware overall of *environmental* benefits from the protected area, which could be explained by the close connection of these benefits to their living and employment needs, and the lack of socioeconomic and political organization in many of the communities. While sharing socioeconomic benefits is vitally important to maintaining a healthy relationship between locals and protected areas, these benefits must be earned and distributed in an integrated way. Thus, the effective development of community benefits from protected areas must be dynamic and participatory, and community leaders must be legitimately empowered to participate in the management process.

ENDNOTES

- ¹ Jiménez, G. (2013). Marketing Department of the Central Conservation Area. (Personal Communication).



Protecting the red-eyed tree frog (*Agalychnis* sp.) also serves tourism purposes on the lowland forests at Braulio Carrillo National Park © Sergio A. Molina-Murillo

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ABOUT THE AUTHORS

Sergio A. Molina-Murillo is associate professor at the National University of Costa Rica (UNA) and research associate at the University of Costa Rica (UCR). His passion and expertise revolves around forestry, socioeconomics, and sustainability. He is the Director and Editor of the *Tropical Journal of Environmental Sciences*, and member of the CITES national Scientific Committee. He is a forest engineer with a Master and Doctorate from the University of Minnesota, the latter in management of natural resources and economics.

Mauricio Fernández Otárola is assistant professor and researcher at the Department of Biology in the University of Costa Rica, San José, Costa Rica. He is a biologist interested in tropical forest ecology and plant reproduction, especially the interactions between animals and plants. He studies the effect of environmental factors on these interactions, and the importance of these interactions in the maintenance of biodiversity and the restoration of degraded land.

Kelly Shreeve completed a bachelor's degree in environmental sociology and is currently a master's student studying sociology at Colorado State University. She participated in field research in Costa Rica and has studied people–environment relationships extensively. Currently, she is living in Fort Collins, Colorado and developing a thesis on food systems.

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RESUMEN

Las áreas protegidas son una estrategia esencial en la preservación de los recursos naturales. En la actualidad, un aspecto central del manejo de las áreas protegidas es mantener y mejorar su relación con las comunidades circundantes dado el frecuente conflicto por la existencia y expansión de áreas protegidas debido a restricciones en el uso de la tierra. En este estudio, buscamos entender la conexión entre los beneficios socioeconómicos y ambientales percibidos por las comunidades sobre las áreas protegidas y la fortaleza de la relación percibida entre 12 de estas comunidades y sus correspondientes áreas protegidas en Costa Rica. En total, se realizaron 365 entrevistas casa a casa para recolectar los datos, y se utilizó un modelo logístico y correlaciones para analizar los resultados. Encontramos que existe una conexión significativa entre el nivel de percepción de la relación comunidad-área protegida y el número de beneficios socioeconómicos percibidos del área protegida; sin embargo, dicha conexión no se mantiene para los beneficios ambientales. Este resultado sugiere que los responsables de la formulación de políticas y los administradores de áreas protegidas deberían desarrollar y explicar mejor, de una manera participativa e integradora, los beneficios socioeconómicos adicionales de las áreas protegidas hacia las comunidades, por cuanto la gestión a largo plazo y la supervivencia de las áreas protegidas dependen de la relación que tienen con sus comunidades circundantes. De esta manera se pueden apoyar los objetivos deseados de preservación de los hábitats y la biodiversidad.

RÉSUMÉ

Les aires protégées sont un élément clé pour la préservation des ressources naturelles. L'un des principes fondamentaux de la gestion des aires protégées est de maintenir et d'améliorer leurs relations avec les communautés locales, car l'existence ou l'expansion des aires protégées est souvent source de conflits, en raison des restrictions d'utilisation de ces terres. Cette étude vise à comprendre le lien entre la perception des avantages socio-économiques et environnementaux créés par aires protégées, et la qualité des relations entretenues par 12 communautés avec leurs aires protégées au Costa Rica. 365 entretiens en porte-à-porte ont été menés, puis analysés grâce à un modèle logistique basé sur des corrélations afin d'en déduire les résultats. Nous avons constaté que la qualité des relations entre la communauté et l'aire protégée influence la perception des avantages socio-économiques provenant de l'aire protégée; cependant ceci n'est pas le cas pour les avantages environnementaux. Ces résultats suggèrent que les décideurs et les gestionnaires d'aires protégées se doivent de mieux présenter et expliquer, de manière intégrée et participative, les avantages socio-économiques liés aux aires protégées, car la gestion à long terme et la survie des aires protégées repose sur leurs bonnes relations avec les communautés. La réalisation des objectifs attendus de la préservation des habitats et de la biodiversité sera ainsi favorisée.