



# Co-Managers or Co-Residents? Indigenous Peoples' Participation in the Management of Protected Areas: a Case Study of the Agta in the Philippines

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## Abstract

Indigenous peoples' participation in the co-management of protected areas is recognised as essential for conserving both cultural and biological diversity. While this practice is increasingly common, few studies have quantitatively evaluated the efficacy of these initiatives. Here we examine levels of knowledge and involvement among the Agta, a hunter-gatherer population who co-manage the Northern Sierra Madre Natural Park, the largest protected area in the Philippines. We find that the Agta generally possess low levels of knowledge about the protected area they are supposed to co-manage. Participation in park management is hampered by several factors, including a lack of cultural sensitivity regarding the Agta's foraging lifestyle among park officials and little political will to realistically empower and support the Agta as co-managers. Recommendations to strengthen Agta participation – and indigenous peoples' participation in protected area management more widely – are made to help protect the world's remaining cultural and biological diversity.

**Keywords** Indigenous peoples · Co-management · Protected areas · Agta · Philippines · Conservation

## Introduction

Protected areas are becoming increasingly important for conserving global biodiversity. Due to the escalating rate of deforestation and exploitation of natural resources, protected areas provide an opportunity for biodiversity to be conserved and utilised sustainably (Harmon *et al.* 2008). Protected areas often overlap with areas of cultural diversity, meaning that protecting both biological and cultural diversity frequently occur in

tandem (Maffi 2005) as areas rich in biodiversity are often inhabited by indigenous peoples (Toledo 2001). It is therefore vital to work with the indigenous communities living within protected areas in their development and management.

Globally, specific areas have been designated as protected for centuries, such as ritual land or game reserves, but it is only during the past few decades that they have been used as a vital conservation strategy in safeguarding biodiversity. The number of protected areas has thus dramatically increased (Watson *et al.* 2014). Due to this rapid growth, they are having a larger impact on the local communities living in or near them. As a consequence of this overlap, and due to criticism of management practices that disregarded human rights (such as displacement and ignoring local development needs), the purpose of protected areas now includes supporting peoples' livelihoods (Agrawal and Redford 2009; Borrini-Feyerabend *et al.* 2004; Watson *et al.* 2014).

Indigenous peoples are particularly impacted by the designation of protected areas. Despite lacking a universal definition, indigenous peoples are commonly described as communities that consider themselves as possessing a separate cultural heritage from neighbouring societies and having historical, often pre-colonial, continuity with their land (for a more detailed discussion on the rights of indigenous peoples, see the United

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Nations Declaration on the Rights of Indigenous Peoples (UN 2007)). As the framework of protected areas has changed, so too has the role of indigenous peoples in the development and management of these areas. While previously it was common practice to relocate indigenous communities or to restrict their resource access (Borrini-Feyerabend *et al.* 2004), they are now considered an integral element of the management of protected areas and their involvement is actively sought (Colchester 2004).

As many state-owned top-down approaches to resource management have been unsuccessful, co-management initiatives have been increasingly applied to overcome their limitations (Persoon *et al.* 2003). Co-management is now a globally applied approach to protected area management, and is broadly defined as the shared responsibilities and joint decision-making of key stakeholders (Berkes 2009). Although co-management is being increasingly adopted, the approach has several limitations, such as concerns over legitimacy of the co-management initiative weakening compliance (Jentoft 2000), human rights issues persisting despite local community involvement (Berkes 2009), and conflicts of interest between stakeholders inhibiting successful co-management (Persoon *et al.* 2003).

Despite these problems, co-management gives indigenous peoples the opportunity to participate in park management. Often referred to as ‘rightsholders’ in many countries (“actors socially endowed with legal or customary rights with respect to land, water and natural resources” (Borrini-Feyerabend *et al.* 2013: 15)), indigenous peoples’ participation in co-management is intended to respect their rights to ancestral land and protect their livelihoods, and in theory also benefits the protected area. Such benefits include increased knowledge of local flora and fauna among all parties involved through information-sharing (Berkes 2009) and increased protection of biodiversity through indigenous stewardship (Larsen and Oviedo 2006).

Co-management can be difficult to implement successfully. Indigenous communities are not always given sufficient training on co-management or information about the protected area (Young and Horwich 2004), and therefore do not have the power or resources to co-manage effectively. This reduces their participation and weakens their influence on park decisions. Involvement can also be undermined by other co-managers, such as government officials and Non-Government Organisations (NGOs), who may speak on their behalf (Kothari 2008) or only partly acknowledge their input (Cundill *et al.* 2013). Furthermore, differences in cultural practices between indigenous peoples and other stakeholders can be problematic during decision-making processes (Premauer and Berkes 2015), reducing the impact of their involvement.

The Agta, an indigenous group which faces these challenges, are co-managers of the Northern Sierra Madre Natural Park (NSMNP) in the Philippines. Theoretically, the Agta are well-represented as co-managers of the park (see below) and have been labelled “guards of the mountain

ranges...protectors of the forest” by government officials (Minter 2010: 257). However, previous research suggests that they have limited understanding of the protected area and little decision-making influence (Minter 2010; Minter *et al.* 2014). Here we explore these issues in greater detail and examine the Agta’s participation as co-managers, specifically their knowledge on park rules, their rights as indigenous peoples, and the nature of their involvement in park management. We employ a combination of qualitative semi-structured interviews and quantitative statistics to explore patterns of knowledge and participation. This study also explores the individual and social factors that influence knowledge and involvement, including sex differences, age, geography, social structure, and involvement with external agencies. Our results provide a solid empirical foundation from which initiatives to increase Agta participation – and indigenous peoples’ participation in protected area management more widely – can be built, with the overall aim of protecting the world’s remaining cultural and biological diversity.

## Population, Legislative, and Geographic Background

### Ethnography

The Agta are an indigenous Filipino population from north-east Luzon, believed to have descended from the original colonisers of the Philippines ~35,000 years ago (Bellwood 1999). The Agta’s appearance is distinct from non-Agta Filipinos due to their dark skin, curly hair, and small body size. They practice a predominantly hunter-gatherer lifestyle, and as with many other hunter-gatherers (Boehm 2001), they are egalitarian and lack positions of authority (some camps have ‘chiefs’ but these are appointed by external organisations). This study focuses on the Agta residing in the municipalities of Palanan (~1000 individuals) and Maconacon (~250 individuals). Camp sizes range from single dwellings to larger camps of up to 26 houses, with an average of seven houses. The Agta are semi-nomadic, moving frequently between camps, and have little material wealth.

Although the Agta live in close proximity and frequently interact with non-Agta, conflicts are not uncommon. Throughout history the Agta have been a minority group and often discriminated against (Headland and Headland 1997). The principle reason for this is the difference in the Agta’s lifestyle and culture, which is perceived as unusual among many non-Agta (a more-recently colonised agricultural population), resulting in feelings of hostility (Minter 2010). Interventions aimed to help the Agta have occurred, although these efforts are often misguided and fail to consider the Agta’s distinct way of life (Minter 2010). There is also conflict over resource use, with the Agta feeling that the non-Agta are

impacting their livelihoods by over-exploiting resources. Despite these conflicts, many interactions between the Agta and non-Agta are mutually beneficial, such as trading foraged goods for agricultural products (Peterson 1978).

### Philippine Legislation Surrounding Indigenous Peoples

The inclusion of indigenous peoples in the co-management of protected areas in the Philippines was established in 1992 with the National Integrated Protected Areas System (NIPAS) Act (La Viña *et al.* 2010). This act is the overarching framework for managing the Philippines' protected areas and acknowledges the rights that indigenous communities have to continue living on their ancestral land. To ensure that indigenous peoples are included as co-managers, NIPAS imposed the creation of a Protected Area Management Board (PAMB) for each park. PAMB comprises of representatives from indigenous communities, as well as government officials and NGO representatives, and is responsible for making decisions that benefit both the park and its residents (DENR 1992).

The rights of Filipino indigenous peoples are further recognised through the Indigenous Peoples' Rights Act (IPRA) 1997, which created and gave responsibility to the National Commission on Indigenous Peoples (NCIP) to represent and protect the country's indigenous peoples. A prominent feature of IPRA 1997 was that indigenous communities could claim a Certificate of Ancestral Domain Title (CADT) that legally recognises the indigenous peoples' ownership of ancestral land. An issue preventing successful CADT claims is that ancestral lands often overlap with protected areas, meaning that many CADT claims are unsuccessful as this would conflict with the protected area objectives outlined in the NIPAS Act (La Viña *et al.* 2010; for a background on the Agta's CADT claims see Minter 2010: 261–263). At the time of fieldwork the Agta residing in the NSMNP had not formally received a CADT.

### Northern Sierra Madre Natural Park

Previously designated as a Wilderness Area in 1979, the NSMNP was officially established in 1997 (Presidential Proclamation 978). Located in Isabela province, northeast Luzon, the NSMNP is the largest protected area in the Philippines (359,496 ha; La Viña *et al.* 2010), and approximately 23,000 people (including Agta) reside in the park (Minter 2010). It is home to numerous endangered and endemic species: 48% of mammals, 29% of birds, 72% of amphibians and 56% of butterflies recorded in the park are endemic to the Philippines (DENR 2001). Therefore, the park is considered one of the most important protected areas in the Philippines (DENR 2006).

The park contains valuable resources that are often unsustainably extracted by both local and non-local Filipinos, threatening the park's biodiversity. These include numerous wildlife species, rattan and swiftlet nests (Minter *et al.* 2014), and it is common for residents to use chainsaws, guns and electric- or poison-fishing methods. Another major issue is logging; 20,000–35,000 cubic metres of timber is illegally extracted each year that the Department of Environment and Natural Resources (DENR) does little to combat (van der Ploeg *et al.* 2011). To control resource use a zoning system was implemented. A 'strict protection zone' covers the majority of the park which permits only the Agta to obtain resources through "traditional resource use" (DENR 2001: 73). Other zones include: a 'sustainable use zone' permitting sustainable resource extraction by all; a 'multiple use zone' allowing rural development; and a 'buffer zone' surrounding the park to prevent encroachment (DENR 2001; Minter 2010). Despite this system, the park has poor governance and the rate of unsustainable resource use is not adequately addressed.

As mentioned previously, the park is managed by PAMB, which is governed by the DENR. PAMB is responsible for developing and implementing policies that meet the park's overall goals, including habitat and biodiversity protection and facilitating community-based resource management. Examples of specific topics discussed at PAMB include CADT, resource extraction, park projects, and logging (Minter *et al.* 2014). PAMB has 36 members representing various sectors, including local governments, NGOs, and indigenous communities. Twelve PAMB members are Agta representatives, all of whom are considered chiefs (and also all male). Four meetings occur each year; all members attend two of these, while the executive committee (comprised of nine members, one of which is an Agta representative) meets a further two times annually. In theory any park related decisions need the Agta's consent before implementation. However, Agta attendance is low. On average only four of the 12 Agta members attend these meetings, and when they do, they rarely contribute to discussions. Participation in PAMB is limited by numerous factors, including their illiteracy and low socioeconomic status (Minter *et al.* 2014).

Since the park's formation, various NGOs have worked with the DENR to formulate its management plan and delivering projects promoting sustainable resource use. Previous agencies included PLAN International (PLAN) and World Wide Fund for Nature (WWF), although their involvement was only short-term. PLAN in particular worked closely with the Agta, helping maintain the park's natural resources while ostensibly enhancing their quality of life via community-based projects (Araño and Persoon 1998). More recently, Agta participation in park projects has decreased, and agencies active in the area, such as

Conservation International and Mabuwaya Foundation, focus mainly on biological conservation issues. Nonetheless, the NCIP still work with the Agta, particularly regarding land rights, and collaborate with the DENR to provide opportunities for the Agta to participate in park projects.

## Methods

### Data Collection

Two forms of data collection – surveys and semi-structured interviews – were employed to assess the Agta's knowledge of, and involvement in, NSMNP co-management (see SI for survey and topic guide). Surveys were conducted with all adults in camps visited ( $n = 308$ , average age = 36.6, males = 151) and assessed the Agta's knowledge and perceptions of the NSMNP through a series of short closed-ended questions that focused on awareness of living in a protected area, the park zoning system, IPRA 1997, CADT, and agencies that previously or currently work in the park. Survey data were collected in 20 camps, 13 in the Palanan municipality ( $n = 240$ ) and seven in Maconacon ( $n = 68$ ). Camp sizes ranged from four to 49 adults, with an average of 15.4.

Semi-structured interviews explored these issues in greater detail. Four individuals from each camp were interviewed (except in one large camp where eight individuals were interviewed, one small camp with only three interviewees, plus another small camp where interviews were not conducted). Preference was given to chiefs and individuals who were willing and available to participate. Equal numbers of males and females were interviewed in each camp. Interview questions were based on six themes: overall understanding of the NSMNP and its rules, the park zoning system, CADT, PAMB, agencies working in the park and Agta involvement in park projects. Although a topic guide was used, additional questions were asked depending on individual responses, resulting in some questions differing among participants (hence slight variations in sample sizes reported below). Interview data were collected from 19 camps, 12 of which were in Palanan ( $n = 52$ ) and seven in Maconacon ( $n = 27$ ).

Surveys and interviews were conducted in private to prevent responses being influenced by others. Data were collected with the help of a translator who spoke the local dialect. Questions were asked in English by the researcher and then translated into the local dialect (Paranan, Tagalog, or Ilocano). Prior to data collection, translators were trained on the context of the questions to ensure that they understood why these questions were asked and to check that the meaning remained the same after translation. Data collection occurred between February and October 2014.

### Statistical Analysis

To assess knowledge, participants were assigned a score out of 11, calculated by summing their survey responses, with a point given for each agency or other park-related subject known. Zero points were given if the participant had not heard, or were unsure if they had heard, of a topic. To analyse involvement, independent analyses were conducted for each of the three questions. Answers were converted to a binary variable for each question and all 'don't know' responses coded as missing. This was employed for the involvement analyses but not the knowledge analyses due to greater ambiguity over a 'don't know' response regarding involvement (i.e., a 'don't know' response to recognising an agency was interpreted as not knowing it, while a 'don't know' response to feeling involved in park decisions is different from unequivocally stating no involvement).

Analyses employed multi-level models to control for the non-independence of data points (individuals clustered within camps; Kreft and de Leeuw 1998). For each analysis, model fit was compared (using AIC values) to determine whether the data possessed a multi-level structure. Linear regressions were employed for knowledge, while logistic regressions were used for involvement analyses. Independent variables included age, sex, distance from main town, chief presence, whether the camp had an evangelical church and municipality (Palanan or Maconacon). Analyses were conducted in R (R Core Team 2015) using the package *lme4*.

Data from semi-structured interviews were coded according to participant's park knowledge, involvement, and their role as co-managers. Percentages are used to show trends and quotations utilised to add context.

**Data Availability** The datasets analysed during the current study are available from the corresponding author on reasonable request.

## Results

### Agta's Knowledge of the Northern Sierra Madre Natural Park

Knowledge of park rules and associated legislation was generally low among the Agta (Table 1), with an average knowledge score of 4.2 out of 11.

Only 44% of individuals surveyed were aware they were living in a protected area (Fig. 1). Similarly, only 21 of 69 (30.4%) individuals interviewed felt they understood what a protected area was, while only nine of these 21 (42.9%) who attempted to define it were broadly correct. Two activities were identified by the majority of individuals interviewed as

**Table 1** Descriptive statistics for variables used in the knowledge score analysis

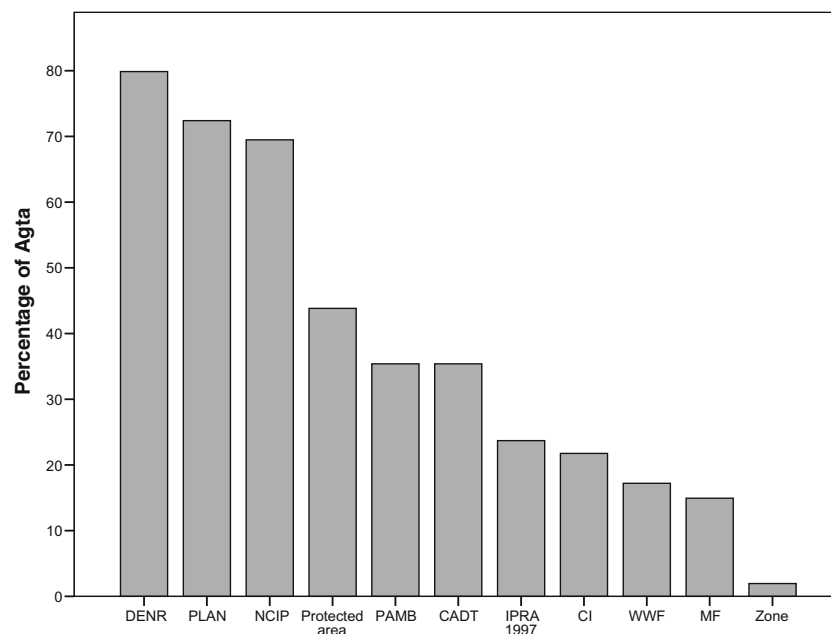
Variable	Variable level	Average	S.D	Minimum value	Maximum value
Knowledge score	Individual	4.17	2.53	0	11
Age	Individual	36.57	14.5	14.62	78.32
Distance from main town (km)	Camp	14.8	6.79	1.88	28.9
Number of cases					
Sex	Individual	Male = 151; Female = 157			
Chief	Camp	Chief = 7; No chief = 13			
Church	Camp	Church = 4; No church = 16			
Municipality	Camp	Palanan = 13; Maconacon = 7			

Knowledge score, age, and camp distance from main town are continuous variables, while sex, chief, church, and municipality are binary variables. Individual-level variables ( $n = 308$ ) and camp-level variables ( $n = 20$ ) are also labelled

being illegal in the park: electric/poison/dynamite fishing (84.1%) and logging (77.2%;  $n = 79$ ).

While 35.4% of individuals surveyed recognised PAMB, only five of 26 (19.2%) interviewees who had heard of PAMB felt they understood its purpose. Of the three individuals who tried to define it, only one expressed an adequate understanding. Despite this, four individuals interviewed claimed to have previously attended a PAMB meeting. Although their experiences were generally positive, one individual said “they are supportive in what I say, but they do not act upon this.” After PAMB was explained to interviewees, 85.7% of 77 individuals said that they would like to attend a PAMB meeting if given the opportunity.

Most individuals surveyed were aware of one or more government agency or NGO that had worked in the park (87.7%). The best-known agencies were the DENR, PLAN, and NCIP, while the least known were Conservation International, WWF and Mabuwaya Foundation (Fig. 1). Most individuals expressed their opinion that the DENR (28 out of 34) and the NCIP (10 out of 11) were effective, although a few mixed responses were given. Comments included “there are some DENR employees who keep the forest and ocean good, but there are some employees who are doing the illegal activities. It makes me feel sad as they are only pretending to help protect the forest and ocean,” and “[the NCIP] are always promising but nothing happens.”



**Fig. 1** Percentage of Agta respondents who knew each of the items asked in the knowledge survey (questions = 11;  $n = 308$ ). Questions included: whether they knew that they were living in a protected area, what zone they were residing in, and had heard of agencies, policies, and NGO’s that work in the protected area on conservation projects or to empower the Agta (DENR: Department of Environment and Natural Resources; PLAN

International; NCIP: National Commission on Indigenous Peoples; PAMB: Protected Area Management Board; CADT: Certificate of Ancestral Domain Title; IPRA 1997: Indigenous Peoples’ Rights Act 1997; CI: Conservation International; WWF: World Wide Fund for Nature; and MB: Mabuwaya Foundation)

The majority of surveyed individuals did not know which zone they were residing in (98%), and had not heard of a CADT (64.6%) or IPRA 1997 (76.3%). Eleven of 76 (14.5%) interviewees believed they knew what a CADT was, although only eight individuals correctly described one.

Next, the factors influencing knowledge were explored. As the null multi-level model was a better fit (null AIC = 1449.1; null multi-level AIC = 1401.4) multi-level models were used. In a multivariate model including all independent variables (see Table 1 for descriptive statistics), both individual- and camp-level factors predicted knowledge (Table 2). Older participants were more knowledgeable, with approximately a 20-year increase in age associated with a one unit increase in knowledge. Participants residing in camps with a chief were also associated with increased knowledge, with a score 1.23 higher relative to camps without a chief. On average, males possessed an additional 0.83 knowledge points. Furthermore, camp location was associated with knowledge, with an additional 10 km increase from the town predicting a decrease in knowledge by approximately one unit (Fig. 2).

### Agta Perceptions of Involvement

Of the 308 individuals surveyed, 271 responded that there was an individual or agency they could report illegal activities to (chiefly electric/poisoning fishing and illegal logging). After removing nine ‘don’t know’ responses, 90.6% of individuals had someone to report illegal activities to, while 9.4% had no-one. The most common person or agency identified were *barangay* (district) officials (58.5%) and Agta chiefs (18.7%).

A small proportion of interviewees had previously reported an illegal activity (23.4%; 11 out of 47), although the outcome of this reporting varied. One individual discussed how he reported a *barangay* official electric fishing to the *barangay* captain but no action was taken, saying “I feel angry that nothing happened and that there’s no-one else to report illegal activities to.” Some individuals discussed how their *barangay* captain attempts to stop illegal activities but has little impact, and one said “the people don’t listen.” Although the majority of individuals surveyed were able to identify who they could

report illegal activities to, 85.7% of 28 interviewees would not actually make a report. The most common reason was fear of retaliation from the person performing the activity, with some individuals commenting “I am worried that the person doing the illegal activity will kill me,” “the non-Agta would get angry with me,” and “we don’t want quarrelling or misunderstanding, so if we see cutting of trees we just ignore it.”

When we explored the factors influencing whether the Agta identified an individual or agency to report illegal activities we found the null multi-level model possessed greater model fit (null AIC = 187.9; null multi-level AIC = 179.4). No variables were significantly associated with identifying someone to report to (Table 3; although females and individuals from camps with a chief were slightly more likely to name someone).

Of the individuals surveyed, 101 felt they had enough information on the NSMNP and its rules, while 101 did not (50% each, after removing 106 ‘don’t know’ responses). In contrast, after removing 59 ‘don’t know’ responses, 203 (81.5%) individuals responded that the Agta had enough influence on park management, while 46 (18.5%) felt they did not. Thus, perceptions of Agta influence over park decisions were ~30% points higher than perceptions of whether individuals had enough information.

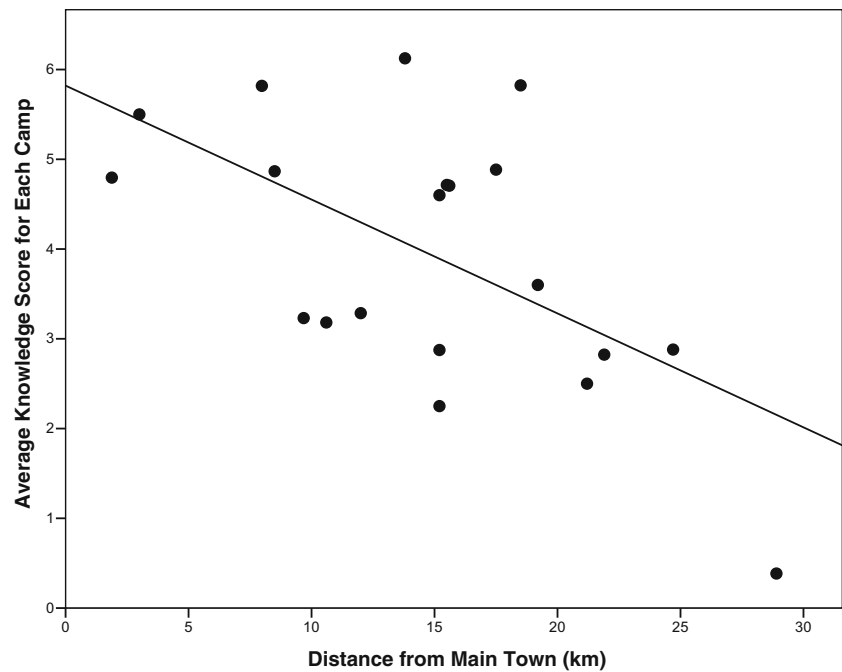
Factors influencing perceptions of having enough information were explored. Multi-level models were used as the null multi-level model was a better fit (null AIC = 282; null multi-level AIC = 271.5). Individuals from camps with a chief were approximately 2.5 times more likely to state they had enough information than those without a chief (Table 3). No other effects were significant. When exploring perceptions of Agta influence regarding park decision-making, the two null models were equivalent (null AIC = 240.3; null multi-level AIC = 241.1), so non-hierarchical models were used. No variables in this analysis were associated with whether the Agta felt they had enough influence over park decisions (Table 3). To explore if there was an association between knowledge and perceptions of involvement three additional logistic regressions were conducted; in each model greater knowledge was associated with greater perceived involvement (Table 4).

**Table 2** Results of the multi-level model for variables predicting an individual’s knowledge score ( $n = 308$ , camps = 20)

Variable	Level	Coefficient	S.E	<i>p</i> -value
Intercept	–	3.05	0.71	<0.001
Sex (ref = male)	Individual	<b>–0.83</b>	<b>0.23</b>	<b>&lt;0.001</b>
Age	Individual	<b>0.05</b>	<b>0.01</b>	<b>&lt;0.001</b>
Distance from main town (km)	Camp	<b>–0.09</b>	<b>0.03</b>	<b>0.003</b>
Chief (ref = no chief)	Camp	<b>1.23</b>	<b>0.46</b>	<b>0.007</b>
Church (ref = no church)	Camp	0.55	0.59	0.347
Municipality (ref = Palanan)	Municipality	0.82	0.48	0.088

Positive coefficients indicate an increase in knowledge score. Significant findings are highlighted in bold

**Fig. 2** Scatterplot displaying the relationship between the average camp knowledge score and distance from main town (km;  $n = 20$ ). Increased distance to town is associated with a decrease in knowledge about park rules and legislation



## Discussion

According to the NIPAS Act and the NSMNP Management Plan the Agta are co-managers of the NSMNP and should be actively involved in park management, yet our research suggests that this is not the case. Our findings highlight that the Agta lack basic knowledge of the protected area they live in, suggesting that they are unable to co-manage effectively. Indeed, fewer than half of all individuals were even aware they were living in a protected area. These results have significant implications for co-management plans and highlight the importance of quantifying participation in these co-management

schemes (Minter *et al.* 2014), as well as identifying recommendations for future practice.

Given that the Agta are theoretically responsible for co-managing the NSMNP, the average knowledge score was low (4.2 out of 11). Although many individuals were aware of at least one agency working in the park, the majority of individuals had not heard of many aspects central to successful participation in protected area management, such as IPRA 1997, PAMB, CADT, or the zoning system. These findings demonstrate that overall the Agta have a poor understanding of the park and their rights as indigenous peoples. Both age and sex influence knowledge, with males and older individuals more

**Table 3** Results of the three logistic regression models predicting perceptions of park involvement

Variable	Reporting illegal activities	Enough park information	Enough Agta influence over park decisions
Intercept	2.03 (1.18) <sup>*</sup>	-1.73 (0.79) <sup>*</sup>	1.21 (0.75)
Sex (ref= male)	0.78 (0.44) <sup>*</sup>	-0.48 (0.31)	0.5 (0.34)
Age	-0.01 (0.02)	0.01 (0.01)	0.01 (0.01)
Distance from main town (km)	-0.02 (0.05)	0.05 (0.03)	-0.03 (0.03)
Chief (ref= no chief)	1.36 (0.78) <sup>*</sup>	<b>0.98 (0.47)<sup>*</sup></b>	0.46 (0.4)
Church (ref= no church)	0.73 (1.05)	0.48 (0.59)	0.0 (0.51)
Municipality (ref= Palanan)	0.03 (0.71)	0.61 (0.52)	-0.25 (0.43)

For reporting an illegal activity, a positive value indicates an increase in the likelihood of an individual identifying an individual or agency to report illegal activities to ( $n = 299$ ). A positive value for enough information indicates an increase in the likelihood of an individual perceiving that they have enough information on the park ( $n = 202$ ). A positive value for enough influence indicates an increase in the likelihood of an individual perceiving that the Agta have enough influence over park management ( $n = 249$ ). ‘Reporting illegal activities’ and ‘enough park information’ models are multi-level models, while the ‘Agta influence over park decisions’ model is a non-hierarchical regression (see text). Coefficients and standard errors (displayed in brackets) are log-odd estimates. Odds ratios are presented in text where significant. Significant findings are highlighted in bold

*P*-value codes: <sup>\*</sup> < 0.1, <sup>\*</sup> < 0.05, <sup>\*\*</sup> < 0.01, <sup>\*\*\*</sup> < 0.001

**Table 4** Logistic regressions predicting perceptions of park involvement based on an individual's knowledge score

Variable	Reporting illegal activities	Enough park information	Enough Agta influence over park decisions
Intercept	1.8 (0.54)***	-1.86 (0.47)***	0.59 (0.35) <sup>†</sup>
Knowledge score	<b>0.21 (0.11)*</b>	<b>0.37 (0.08)***</b>	<b>0.21 (0.08)**</b>

A positive value indicates an increase in perceptions of involvement with increasing knowledge score for identifying an individual or agency to report illegal activities to ( $n = 299$ ), having enough information on the park ( $n = 202$ ), and the Agta having enough influence over park management ( $n = 249$ ). 'Reporting illegal activities' and 'enough park information' models are multi-level models, while the 'Agta influence over park decisions' model is a non-hierarchical regression (see text). Coefficients and standard errors (displayed in brackets) are log-odd estimates. Odds ratios are displayed in text where relevant. Significant findings are highlighted in bold

P-value codes: <sup>†</sup> < 0.1, \* < 0.05, \*\* < 0.01, \*\*\* < 0.001

knowledgeable than females or younger Agta. One explanation for these differences could be that older males are invited to park-related meetings more frequently than females and younger males. This gender bias was noted in previous research (Minter 2010) and indicates little improvement of female participation over the past decade. Despite this, a large percentage of females stated they would like to be included in PAMB meetings (~70%; although, as noted by some women, child-rearing responsibilities can make attendance at distant meetings difficult). Age may also influence knowledge as the older generation may have participated in early park projects managed by PLAN, which were still remembered by older individuals despite their project ending in 2002. Additional exploration of the association between age and knowledge suggests that this may be the case, as the knowledge of individuals younger than ~30 years (and therefore children during PLAN's presence) was lower than older individuals, after which knowledge appears to plateau (Fig. S1). This suggests that earlier interventions that were inclusive of the Agta may have been more effective in engaging them with park issues. Indeed, interviews highlighted the fact that the Agta were not updated on changes in park management, with one individual commenting "I don't know why they [PLAN] don't come here anymore."

The presence of a camp chief was also associated with increased knowledge. At face value this could be interpreted as chiefs disseminating information to camp-mates and thus increasing overall camp knowledge. Descriptive statistics suggest that chiefs were more knowledgeable than non-chiefs (mean chief knowledge score = 7 ( $n = 7$ ); mean non-chief knowledge score = 4.1 ( $n = 301$ )). However, this information may not be transmitted to camp-mates. When asked who informed them about illegal activities, only two individuals (of 48; 4.2%) identified a chief, whereas the most common responses were the DENR (39.6%) and *barangay* captain (25%). Although further research is needed to fully determine how the Agta are informed on park issues, this suggests that chiefs do not

often inform camp-mates. As is common among other egalitarian hunter-gatherers, individual Agta (including chiefs) have little authority to tell camp-mates how to behave as this would violate the egalitarian ethic of autonomy (Gardner 1991). Rather, Agta chiefs tend to act as mediators in disputes or as spokesmen to outsiders. Therefore, other factors associated with having a chief may enhance knowledge. For example, camps are encouraged to appoint chiefs by park agencies and church groups, and it is possible that these camps are informed by these external agencies more than camps without a chief.

Furthermore, only chiefs are selected as PAMB members (Minter 2010). These individuals are responsible for participating in park decision-making and are crucial for the Agta's involvement in park management. However, this system does not consider the Agta's egalitarian social system in which group decisions are generally reached by consensus rather than by the opinions of a select few. This role of chief as primarily mediator rather than decision-maker was exemplified by one chief who, when asked about the decision-making process in camp, replied that "everyone has a voice, and whoever is the best they [will] follow, because even though I am the chief, it's not good if my decision is the only one to be followed as I may not be right." Therefore, the current PAMB organisation may not be the optimal system to empower the Agta as co-managers but may potentially be limiting participation (in addition to other PAMB barriers; Minter *et al.* 2014).

The final factor associated with knowledge was distance, with individuals in camps located closest to main towns possessing greater knowledge than more distant camps. As park-related meetings are mainly held in municipal towns they are more accessible to those living in the vicinity. Furthermore, distant camps have less contact with park officials due to the time and effort it takes to reach them. Although the DENR and NCIP do occasionally visit distant camps, comments made by the Agta suggest that they only visit if attending a meeting, engaging with *barangay* captains or visiting plantations. One individual commented "they [DENR] have come to the camp before



but didn't talk to me. I don't know what they wanted." Although agencies may occasionally visit areas near Agta camps, they rarely inform the Agta of park updates.

In contrast to knowledge, few variables affected the Agta's perception of their involvement in park management. The main factor was that the presence of a chief was associated with an increased probability of an individual stating that they had enough park information. As discussed above, this chief effect is plausibly linked to the wider implications of having a chief (e.g., greater external agency involvement). However, only 50% of Agta felt they had enough information on the NSMNP, which highlights the need for greater information sharing. As knowledge predicted involvement in all three domains, an essential first step towards greater Agta participation would be to increase their knowledge and awareness of the issues.

Additionally, it is important to note that although most Agta identified someone to report illegal activities to, very few individuals stated that they would actually make a report. This was largely due to fear of retaliation from non-Agta, highlighting the underlying conflict and power asymmetry existing between Agta and non-Agta. While some Agta do attempt to stop illegal activities, this also demonstrates that the Agta are largely powerless to prevent these activities, despite their role as co-managers.

## Recommendations

It is evident from our findings that the Agta are not equipped or empowered as co-managers of the NSMNP, and that the current structure of PAMB is not an effective system to facilitate Agta participation. Therefore, we suggest that an important first step in enhancing the Agta's role as co-managers would be to extend and restructure PAMB. Not only does previous research show that attendance and participation issues exist for Agta representatives at PAMB meetings (Minter *et al.* 2014), this study also demonstrates that appointing Agta representatives may be an ineffective method for information-sharing among the Agta. While chiefs may attend these (and other) meetings, their highly-autonomous egalitarian social system means that this knowledge is rarely transmitted to camp-mates. Implementing regular meetings regarding current park issues for all Agta in each municipality (alongside the existing PAMB meetings) may be a more successful strategy. The meeting should be attended by non-Agta PAMB members, and would give the Agta the opportunity to make joint decisions. Meetings on this scale would require great organisation, but attendance at similar meetings has previously been high (Minter *et al.* 2005). This style of meeting would permit a decision-making process analogous to everyday group decisions, which may increase participation and empower the Agta as co-managers. Furthermore, unlike the current PAMB meetings (Minter *et al.* 2014) it is important that

expenses incurred by the Agta attending these meetings are reimbursed to ensure that participation is not limited by the Agta's socioeconomic situation.

Secondly, this study demonstrates the importance of knowledge in increasing the Agta's perceptions of involvement in park management, highlighting the need for all Agta to be regularly updated on park issues. The DENR should be responsible for this, and here we suggest that they update the Agta by regularly visiting Agta camps. Due to the distant locations of camps and the large number of individuals (~2000 Agta live in the NSMNP; Minter 2010), this may be logistically difficult, but could build upon existing structures. One option would be to implement a similar format to the current *barangay* meetings, which are meetings for residents to discuss local issues and occur close to Agta camps. Additional data collected on the *barangay* meetings show that they are frequently attended by Agta (72.4% of 76 Agta had attended one or more meetings). Participation in these *barangay* meetings is also less sex-biased, with approximately an equal proportion of men and women attending. Although contributions are not exceptionally high (~40% of individuals claimed to have actively contributed to discussions), the majority of Agta across all *barangays* felt that their *barangay* captain would listen and take action if they raised an issue (95% of 40), with one individual commenting that they were "proud to raise issues" at these gatherings. This could be due to the familiarity and trust that the Agta have with the *barangay* captain, who attends all meetings. Therefore, it is essential that the same DENR representative chairs these meetings to help facilitate trust between the Agta and the DENR, which is critical for effective co-management (Berkes 2009).

Thirdly, it is important that women are equally informed and involved in park decisions as men. Recent evidence has highlighted that conservation outcomes are improved if women are involved in co-management of natural resources (Leisher *et al.* 2016). Additionally, as outlined by the United Nations Sustainable Development Goals, gender equality is essential for long-term sustainable development (United Nations 2015). Therefore, women should be invited to park-related meetings and female PAMB membership encouraged. Not only will increasing women's participation reduce the divide in knowledge between the sexes, it is also more compatible with the Agta's social system of sex equality (Dyble *et al.* 2015). In this system, many Agta women are extremely active in the social and political lives of their communities and are often highly influential decision-makers (see also Endicott and Endicott 2008).

Although implementation of these recommendations is needed to strengthen the Agta's role as co-managers (see also Minter *et al.* 2014), it would be difficult to fully achieve an effective co-management scheme without examining the wider social context. The Agta's lifestyle is still denigrated

by some non-Agta, so it is imperative that all park stakeholders are culturally sensitive to the Agta's livelihood by not imposing their own standards but rather adapting their institutions to maximise Agta participation (Page *et al.* 2018). While increased cultural sensitivity may help empower the Agta, greater Agta participation may benefit the park in other ways. For instance, many individuals interviewed mentioned using a 'gay-gay' – a length of string tied over a river, traditionally used to prevent people entering an area after someone has died – in an attempt to prevent illegal activities such as electric fishing. Non-Agta are aware of *gay-gays* and generally respect them. Thus, in addition to the Agta's vast local ecological knowledge (van der Ploeg and van Weerd 2010), customs such as *gay-gays* can be embraced and encouraged to help protect natural resources.

The Agta are seen as 'guardians' of the NSMNP by park agencies (Minter 2010), yet they lack the knowledge, resources, and support to even begin to attempt this, let alone succeed. Although many Agta harbour positive attitudes towards protecting the NSMNP, as a result of their socio-political circumstances they have no power to meaningfully effect change, and are often frightened of retaliation if they do report illegal activities. In effect, they are given much of the responsibility for protecting the NSMNP yet none of the support necessary to achieve this. All inhabitants of the park, not just the Agta, utilise and extract resources from it, so approaches that include all park residents need to be developed. Although we did not collect data on non-Agta's knowledge and perceptions for this study, field assistants (who were local non-Agta) had to be trained on the NSMNP prior to fieldwork as they were not aware of park regulations. Protecting the NSMNP should not be solely the Agta's responsibility but rather all inhabitants of the park.

This is part of a more deep-rooted problem that the NSMNP is simply a 'paper park' and is not protected adequately (Minter 2010). The protected area status of the park is not taken seriously by its inhabitants and illegal activities are a frequent occurrence. Non-Agta residents and DENR and government officials regularly extract resources illegally; one reason the Agta rarely engage in these activities is because of financial restraints on purchasing the necessary equipment. This is made clear by one Agta who said that "poisoning and electric fishing happens by the non-Agta as the Agta do not have enough money to buy the poison." Corruption is rife in the Philippines (Transparency International 2015). This is clear in the NSMNP (Minter 2010), and similar stories of political corruption among park officials hindering the prevention of (or even participating in) illegal activities were observed throughout this study. One non-Agta woman discussed how she would not attempt to stop someone illegally extracting resources because her husband wanted to become a *barangay* official. This corruption and lack of political will urgently need addressing, and methods that provide either

greater incentives or harsher punishments to prevent them need to be implemented. If these issues are not addressed soon, the future of the NSMNP appears bleak and the largest area of biodiversity in the Philippines, as well as the Agta's unique way of life, may be lost.

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## Compliance with Ethical Standards

**Conflict of Interest** The authors declare they have no conflicts of interest.

**Ethical Approval** Ethical clearance was granted by the University College London Ethics Committee (UCL Ethics code 3086/003). Fieldwork permission was granted by local government units, including the Mayors of the Municipalities visited, and by the Department of Environment and Natural Resources (DENR) as the research took place in a protected area. Each Agta community agreed to participate and informed consent was obtained from all individuals.

## References

- Agrawal, A., and Redford, K. (2009). Conservation and displacement: an overview. *Conservation and Society* 7(1): 1–10.
- Araño, R. R., and Persoon, G. A. (1998). Action research for community-based resource management and development: The case of the Northern Sierra Madre Natural Park conservation project, northeastern Philippines. In Seminar proceedings 1998, Research in Tropical Rain forests: Its Challenges for the Future. The Tropenbos Foundation, Wageningen, pp. 89–101.
- Bellwood, P. (1999). Archaeology of southeast Asian hunters and gatherers. In Lee, R. B., and Daly, R. (eds.), *The Cambridge Encyclopedia of Hunters and Gatherers*, Cambridge University Press, Cambridge, pp. 284–288.
- Berkes, F. (2009). Evolution of co-management: role of knowledge generation, bridging organizations and social learning. *Journal of Environmental Management* 90(5): 1692–1702.
- Boehm, C. (2001). *Hierarchy in the Forest: The Evolution of Egalitarian Behavior*. 2nd ed, Harvard University Press, Cambridge.
- Borrini-Feyerabend, G., Kothari, A., and Oviedo, G. (2004). *Indigenous and Local Communities and Protected Areas: Towards Equity and Enhanced Conservation*. IUCN, Gland. Accessed 20 Aug 2017 at [https://cmsdata.iucn.org/downloads/pag\\_011.pdf](https://cmsdata.iucn.org/downloads/pag_011.pdf).
- Borrini-Feyerabend, G., Dudley, N., Jaeger, T., Lassen, B., Broome, N., Phillips, A., and Sandwith, T. (2013). *Governance of Protected Areas: From Understanding to Action*. Best Practice Protected Area Guidelines Series No. 20. IUCN, Gland. Accessed 20 Aug

- 2017 at [http://cmsdata.iucn.org/downloads/governance\\_of\\_protected\\_areas\\_from\\_understanding\\_to\\_action.pdf](http://cmsdata.iucn.org/downloads/governance_of_protected_areas_from_understanding_to_action.pdf).
- Colchester, M. (2004). Conservation policy and indigenous peoples. *Environmental Science and Policy* 7(3): 145–153.
- Cundill, G., Thondhlana, G., Sisitka, L., Shackleton, S., and Blore, M. (2013). Land claims and the pursuit of co-management on four protected areas in South Africa. *Land Use Policy* 35: 171–178.
- DENR [Department of Environment and Natural Resources] (1992). National Integrated Protected Areas System Act 1992 (Republic Act No. 7586). DENR, Manila. Accessed 20 Aug 2017 at <http://www.wipo.int/edocs/lexdocs/laws/en/ph/ph070en.pdf>.
- DENR [Department of Environment and Natural Resources] (2001). Management plan for the Northern Sierra Madre Natural Park. DENR, Palanan.
- DENR [Department of Environment and Natural Resources] (2006). Northern Sierra Madre Natural Park and Outlying Areas Inclusive of the Buffer Zone. Accessed 20 Aug 2017 at <http://whc.unesco.org/entativelists/5037/>.
- Dyble, M., Salali, G. D., Chaudhary, N., Page, A., Smith, D., Thompson, J., Vinicius, L., Mace, R., and Migliano, A. B. (2015). Sex equality can explain the unique social structure of hunter-gatherer bands. *Science* 348(6236): 796–798.
- Endicott, K. M., and Endicott, K. L. (2008). *The Headman was a Woman: the Gender Egalitarian Batek of Malaysia*, Waveland Press, Long Grove.
- Gardner, P. M. (1991). Foragers' pursuit of individual autonomy. *Current Anthropology* 32(2): 543–572.
- Harmon, D., Figgis, P., and Crofts, R. (2008). *For Life's Sake: How Protected Areas Enrich our Lives and Secure the Web of Life*. IUCN, Gland. Accessed 20 Aug 2017 at <https://www.iucn.org/sites/dev/files/import/downloads/pasforlifesake.pdf>
- Headland, T. N., and Headland, J. D. (1997). Limitation of human rights, land exclusion, and tribal extinction: The Agta negritos of the Philippines. *Human Organization* 56(1): 79–90.
- Jentoft, S. (2000). Legitimacy and disappointment in fisheries management. *Marine Policy* 24: 141–148.
- Kothari, A. (2008). Protected areas and people: the future of the past. *Parks* 17(2): 23–34.
- Kreft, I. G. G., and de Leeuw, J. (1998). *Introducing Multilevel Modelling*, Sage Publications, London.
- La Viña, A. G., Kho, J. L., and Caleda, M. J. (2010). *Legal Framework for Protected Areas: Philippines*. IUCN, Gland. Accessed 20 Aug 2017 at <http://cmsdata.iucn.org/downloads/philippines.pdf>.
- Larsen, B. P., and Oviedo, G. (2006). Reconciling Indigenous peoples and protected areas: rights, governance and equitable cost and benefit sharing. IUCN, Gland. Accessed 20 Aug 2017 at [https://cmsdata.iucn.org/downloads/iucn\\_reconciling\\_ip\\_and\\_pa.pdf](https://cmsdata.iucn.org/downloads/iucn_reconciling_ip_and_pa.pdf).
- Leisher, C., Temsah, G., Booker, F., Day, M., Samberg, L., Prosnitz, D., Agarwal, B., Matthews, E., Roe, D., Sunderland, T., and Wilkie, D. (2016). Does the gender composition of forest and fishery management groups affect resource governance and conservation outcomes? A systematic map. *Environmental Evidence* 5: 6.
- Maffi, L. (2005). Linguistic, cultural, and biological diversity. *Annual Review of Anthropology* 29: 599–617.
- Minter, T. (2010). *The Agta of the Northern Sierra Madre. Livelihood Strategies and Resilience among Philippine Hunter-Gatherers*. Leiden University.
- Minter, T., Cureg, M. C., van der Ploeg, J., Bagunu, A. M., Aggabao, M. R., Valencia, J. G., Aquino, D. M., and Ranay, M. L. (2005). *Ako ay Agta, Ako ay Pilipino! Proceedings of the Agta Workshop*, Golden Press, Tuguegarao City.
- Minter, T., van der Ploeg, J., Pedrablanca, M., Sunderland, T., and Persoon, G. A. (2014). Limits to indigenous participation: the Agta and the Northern Sierra Madre Natural Park, the Philippines. *Human Ecology* 42(5): 769–778.
- Page, A. E., Minter, T., Viguier, S., and Migliano, A. B. (2018). Hunter-gatherer health and development policy: How the promotion of sedentism worsens the Agta's health outcomes. *Social Science and Medicine* 197: 39–48.
- Persoon, G. A., van Est, D. M. E., and Sajise, P. E. (2003). *Co-management of natural resources in Asia. A comparative perspective*. NIAS Press, Copenhagen.
- Peterson, J. T. (1978). Hunter-gatherer/farmer exchange. *American Anthropologist* 80(2): 335–351.
- Premauer, J. M., and Berkes, F. (2015). A pluralistic approach to protected area governance: indigenous peoples and Makuira National Park, Colombia. *Ethnobiology and Conservation* 4: 1–16.
- R core Team (2015). *R: A language and environment for statistical computing*, R Foundation for Statistical Computing, Vienna.
- The Indigenous Peoples' Rights Act (1997). Republic Act No. 8371. Accessed 18 July 2018 at <http://www.wipo.int/edocs/lexdocs/laws/en/ph/ph083en.pdf>.
- Toledo, V. M. (2001). Indigenous peoples and biodiversity. In Levin, S. (ed.), *Encyclopedia of Biodiversity*, Academic Press, San Diego, pp. 451–463.
- Transparency International (2015). *Corruption Perceptions Index 2015*. Accessed 20 Aug 2017 at <http://www.transparency.org/cpi2015>.
- United Nations (2007). *United Nations Declaration on the Rights of Indigenous Peoples*. Accessed 9 March 2018 at [http://www.un.org/esa/socdev/unpfii/documents/DRIPS\\_en.pdf](http://www.un.org/esa/socdev/unpfii/documents/DRIPS_en.pdf).
- United Nations (2015). *Transforming our World: The 2030 Agenda for Sustainable Development*. Accessed 20 Aug 2017 at <https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf>
- van der Ploeg, J., and van Weerd, M. (2010). Agta bird names: an ethno-ornithological survey in the Northern Sierra Madre Natural Park, Philippines. *Forktail* 26: 127–131.
- van der Ploeg, J., van Weerd, M., Masipiqueña, A. B., and Persoon, G. A. (2011). Illegal logging in the Northern Sierra Madre Natural Park, the Philippines. *Conservation and Society* 9(3): 202–215.
- Watson, J. E. M., Dudley, N., Segan, D. B., and Hockings, M. (2014). The performance and potential of protected areas. *Nature* 515: 67–73.
- Young, C. A., and Horwich, R. (2004). History of protected area designation, co-management and community participation in Belize by history of protected area designation in Belize. In Balboni, B. S., Palacio, J. O., and Awe, J. J. (eds.), *Taking Stock: Belize at 25 years of Independence*, Cubola Productions, Belize, pp. 123–145.