

Effect of Local Cultural Context on the Success of Community-Based Conservation Interventions

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Abstract: *Conservation interventions require evaluation to understand what factors predict success or failure. To date, there has been little systematic investigation of the effect of social and cultural context on conservation success, although a large body of literature argues it is important. We investigated whether local cultural context, particularly local institutions and the efforts of interventions to engage with this culture significantly influence conservation outcomes. We also tested the effects of community participation, conservation education, benefit provision, and market integration. We systematically reviewed the literature on community-based conservation and identified 68 interventions suitable for inclusion. We used a protocol to extract and code information and evaluated a range of measures of outcome success (attitudinal, behavioral, ecological, and economic). We also examined the association of each predictor with each outcome measure and the structure of predictor covariance. Local institutional context influenced intervention outcomes, and interventions that engaged with local institutions were more likely to succeed. Nevertheless, there was limited support for the role of community participation, conservation education, benefit provision, and market integration on intervention success. We recommend that conservation interventions seek to understand the societies they work with and tailor their activities accordingly. Systematic reviews are a valuable approach for assessing conservation evidence, although sensitive to the continuing lack of high-quality reporting on conservation interventions.*

Keywords: community conservation, conservation and development, ICDP, institutions, participation

Efecto del Contexto Cultural Local sobre el Éxito de Intervenciones de Conservación Basadas en Comunidades

Resumen: *Las intervenciones de conservación requieren ser evaluadas para entender los factores que predicen el éxito o fracaso. A la fecha, ha habido escasa investigación sistemática del efecto del contexto social y cultural sobre el éxito de la conservación, aunque una extensa literatura argumenta que es importante. Investigamos si el contexto cultural local, particularmente las instituciones locales y los esfuerzos de intervenciones para relacionarse con esta cultura influyen significativamente en los resultados de conservación. También probamos los efectos de la participación de la comunidad, educación para la conservación, provisión de beneficios e integración del mercado. Sistemáticamente revisamos la literatura o sobre conservación basada en comunidades y encontramos 68 intervenciones adecuadas para incluirlas. Utilizamos un protocolo para extraer y codificar la información y evaluamos una gama de medidas de resultados exitosos (actitudinal, conductual, ecológica y económica). También examinamos la asociación de cada indicador con cada medida*

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de resultados y la estructura de la covarianza del indicador. El contexto institucional local influyó en los resultados de la intervención, y las intervenciones que involucraron instituciones locales tuvieron mayor probabilidad de éxito. Sin embargo, hubo soporte limitado para el papel de la participación de la comunidad, la educación para la conservación, provisión de beneficios e integración del mercado en el éxito de la intervención. Recomendamos que las intervenciones de conservación intenten entender a las sociedades con que se trabaja y ajustar sus actividades en consecuencia. Las revisiones sistemáticas son un método valioso para evaluar evidencias de la conservación, aunque son sensibles a la escasez de reportes de buena calidad sobre las intervenciones de conservación.

Palabras Clave: conservación comunitaria, conservación y desarrollo, instituciones, participación, PICD

Introduction

Since the 1980s conservation efforts in developing countries have generally tried to incorporate the interests and views of local people (Western et al. 1994). These community-based conservation (CBC) interventions take a variety of forms, from community outreach to integrated conservation and development projects (ICDPs) in which development and conservation goals are equally prioritized (Adams & Hulme 2001).

Despite the popularity of CBC approaches, outcomes have been mixed (Kellert et al. 2000). The literature contains a variety of suggestions for improving the practice of CBC (e.g., Adams & Hulme 2001; McShane & Wells 2004). One common view is that local cultural context has considerable influence on conservation outcomes, and so interventions should pay greater attention to understanding and adapting to this (e.g., Brechin et al. 2002; Peterson et al. 2010). Nevertheless, it is important to test this argument because there are many competing suggestions for how to improve CBC practice, from focusing on market integration to providing education. Systematic reviews of evidence are recommended as a robust and objective approach to informing policy and practice (Roberts et al. 2006; Centre for Evidence-Based Conservation 2008).

Ours is the first systematic review of the importance of local cultural context for the outcomes of conservation interventions. Definitions of *culture*, *society* and its constituent parts are complex, multiple, and contested (Jenkins 2002). Because this topic often receives little attention in conservation publications, we used a simple definition of *local culture* as the shared values and institutions of a particular group of people. In particular, we focused on local institutions, that is, formal and informal rules that act as incentives and constraints on behavior (similar to the definition of North 1991). We thus consider institutions as part of the culture of a place. Local institutions represent and shape local culture and thus are useful to study, particularly because other aspects of culture are difficult to capture and operationalize.

We expect that many aspects of local institutional context can influence conservation outcomes. In many cultures, nongovernmental institutions that reflect shared values (e.g., taboos, community pride, traditions, and codes of conduct) affect resource use and hence conser-

vation (e.g., Alpert 1996; Jones et al. 2008). For example, sacred groves can protect patches of habitat (Bhagwat & Rutte 2006), whereas local hunting traditions can drive unsustainable resource use (Robinson & Bennett 2000). As important as governmental institutions, even those not directly concerned with resource management, because there is growing consensus that corruption and ineffective government underlie many failures in conservation (Smith et al. 2003). We therefore expect that a supportive cultural context, specifically supportive local institutions, will improve the likelihood of success in conservation interventions. This is our first hypothesis.

An understanding of and engagement with local institutions—be it working with community councils or respecting local spiritual guidance—can greatly support an intervention. The opposite effect is true for interventions that conflict with local culture (e.g., Gill 1994). As well as adapting to existing local institutions, attempts to create or improve institutions are likely to be helpful because they improve local capacity for equitable management and adaptation (e.g., Botha et al. 2007). Some case studies show that conservation failure results when interventions make little attempt at local engagement or even promote socially unacceptable activities (e.g., Klein et al. 2007). Therefore, we expected an intervention's positive engagement with local cultural context to improve the likelihood of its success. This is our second hypothesis.

Closely related to these hypotheses is the argument that local participation promotes the success of conservation interventions. Many sources suggest that community participation promotes conservation success (e.g., Campbell & Vainio-Mattila 2003), and this is a key part of the rationale for CBC (Western et al. 1994). There are multiple practical reasons, and moral arguments, why participation is desirable. For example, local involvement can allow incorporation of local knowledge and entails greater interest in and ownership over the resource in question, and so greater concern for its conservation. Some reviews of conservation interventions support this argument (e.g., Gratwicke et al. 2007), whereas others reached no clear conclusion (e.g., Brooks et al. 2006). Therefore, our third hypothesis is that greater community participation will increase the likelihood of intervention success. Furthermore, because knowledge is needed

to understand the purpose of interventions and thus produce local enthusiasm and involvement in conservation (Jacobson et al. 2006), our fourth hypothesis is that interventions that provide conservation education are more likely to succeed.

Many suggest that provision of local economic benefits acts as an incentive for pro-conservation behaviors (e.g., Larson et al. 1998), and Brooks et al. (2006) found that ICDP success is indeed associated with good market links and greater provision of benefits and use of natural resources. Because ICDPs are a subset of CBC interventions, we expected to find a similar effect in our study. Our fifth hypothesis was that market links and local benefit provision improve the likelihood of intervention success.

To maximize our ability to detect effects on outcomes, we used four distinct measures of intervention success. We believe the ultimate measure of success for a conservation intervention must be progress toward species or habitat conservation goals, the ecological outcome. Nevertheless, the CBC rationale argues that conservation success is supported by positive attitudes to conservation interventions (perhaps due to the receipt of financial benefits) and in turn by pro-conservation behaviors of the local community. Therefore, we also recorded attitudinal, behavioral, and economic outcomes. Although we did not expect any single outcome type to be a complete proxy for another, success in one aspect may be a useful indicator of unreported outcome types. Furthermore, use of four-outcome types facilitates comparison with other work.

In summary, the hypotheses we tested in our systematic review are that success in CBC interventions is predicted by a supportive local cultural context, project engagement with a local cultural context, high levels of local participation, conservation education, and market integration and benefit provision by projects.

Methods

The case studies that formed our data set were systematically selected from the literature on conservation interventions. For each case study, we then coded variables that allowed us to test each hypothesis and analyzed the result with statistics suitable for meta-analysis (Littell et al. 2008).

Sampling Evidence

While selecting and coding information, we followed the established principles of systematic reviews (Centre for Evidence-Based Conservation 2008; Littell et al. 2008). We made web-based searches of ISI Web of Knowledge, Anthropology Plus, and JSTOR. We used the search terms *CBC*, *integrated conservation and development*, *ICDP*,

and *community conservation*. Because much grey literature in conservation is of high quality and could be valuable for evaluating and understanding conservation success (e.g., Adams et al. 2002), we also screened the first 500 returns from Google Scholar.

If the title and abstract indicated it might meet the study inclusion criteria, we viewed the full text. About 320 sources appeared acceptable, but 15 could not be viewed due to copyright restrictions. Studies were accepted if they met four criteria: (1) source quality, (2) subject, (3) outcome measurement, and (4) quality of predictor measurement. First, the study had to have been published in the primary literature, not in reviews or other secondary data. Where more than one acceptable source referred to the same intervention, the most recent source was used but we used the older source to supply any missing information about predictors. Second, the subject of the study had to be a CBC intervention. We interpreted CBC broadly as any intervention designed to achieve conservation goals by working with communities, including interventions that encompassed both wildlife and area-based conservation (as in Jones 2007). We did not, however, include interventions designed without conservation goals, such as ecotourism operations set up without explicit conservation aims (e.g., Wunder 2000). Third, at least two of the four-outcome types had to be measured. Finally, no more than 25% missing information about predictors was acceptable. A few sources contained information on more than one intervention: we accepted each of these if they met the inclusion criteria. We reviewed about 270 sources and our final sample size (see Supporting Information) was 68 case studies from 69 sources. Ten sources in the final sample were not peer-reviewed journal articles.

Development of Coding Protocol

We created 15 explanatory variables to describe the context and design of interventions (Table 1). Six variables related to the first and second hypotheses: three described aspects of local cultural context (supportive institutions, human population size, and land tenure) and three described aspects of a project's engagement with local institutions (institution building and engagement with either governmental institutions or nongovernmental institutions and shared values). Local institutions were an aspect of local culture that were frequently reported and feasible for coding. Three variables related to local participation (participation in both design and implementation of intervention and presence of charismatic individuals), one variable represented conservation education, and five related to the extent of benefit sharing and market links (Table 2 & Fig. 1). K.A.W. developed the coding protocol, which was informed by the protocol of Brooks et al. (2006) and tested on studies that did not qualify for inclusion. Where possible, coding of variables matched

Table 1. Variables used as predictors of community-based conservation intervention outcomes and descriptions of what they represent and their coding^a

<i>Hypothesis and variable names</i>	<i>Description of variables and coding</i>
1. Local cultural context	
supportive institutions	information on the supportiveness of nongovernmental institutions (e.g., a taboo on hunting a protected species) and effectiveness of governmental institutions (e.g., intracommunity conflicts indicate poor effectiveness); three-level ordinal variable (from unsupportive/conflicting institutions to supportive institutions)
land tenure	control and ownership of land; four-level ordinal variable from low to high community control (1, no community control; 2, mixed community and other control; 3, local but private land ownership; 4, total communal or community control)
human population size	population size (used as a simple indicator of community homogeneity) targeted by the conservation intervention; seven-level ordinal variable (>50,000, 10,000–50,000, 5,000–10,000, 1,000–5,000, 500–1,000, 200–500, <200)
2. Intervention engagement with local cultural context	
institution building	assistance by the intervention for institution building, activities designed to create/ improve institutions for governance or natural resource management; binary variable (no or yes)
approach to governmental institutions	approach of the intervention to local governmental institutions (local-level organizations and formal social constraints, including constitutions, laws, and enforcement); three-level ordinal score (from conflict to active engagement by an intervention)
approach to nongovernmental institutions and shared values	approach of the intervention to local nongovernmental institutions (such as traditions or religion) and shared values (such as widespread pride in a particular local feature); three-level ordinal score (from conflict to active engagement)
3. Community participation	
establishment input ^b	community involvement in the intervention's initial design and development; five-level ordinal score (from control only by outside NGO or other agency to complete community control)
decision control ^b	community control of day-to-day decision making on the intervention; three-level ordinal scale (from no community to total community control)
charisma	presence of charismatic individuals may strengthen institutions and galvanize support for conservation (Oldfield 2004); recorded as a binary variable (no or yes)
4. Conservation education	
education	provision of conservation education to the community by the intervention; binary variable (no or yes)
5. Benefits and market integration	
market threat	if the principal threat to biodiversity is linked to commercial market forces; binary score (no or yes)
market integration	market integration is based on a community's involvement in wage labor, market sales, market purchases, and distance from markets; three-level ordinal variable (from low to high market integration)
protected area use ^b	if an intervention is associated with a protected area (PA), the permitted resource use of that area is indicated by the IUCN ranking of the area (www.iucn.org/themes/wcpa/ppa/protectedareas.htm); six-level ordinal score (from no use to unrestricted resource use)
intervention benefits ^b	approach of the intervention to the generation and provision of tangible benefits for the community; seven-level ordinal variable ordered as per Brooks et al. (2006) (from no community use to interventions that use a variety of approaches to benefit the community)
benefit inequity	benefits generated by the intervention inequitably distributed; binary variable (yes or no)

^aVariables are ordered such that positive associations with outcomes indicate support for the relevant hypothesis, and where no information was available, a variable is coded NA.

^bWhere possible, to facilitate comparison, we ordered categories and coded variables in the same way as Brooks et al. (2006) (variables: establishment input, implementation; decision control, decision; protected area [PA] use, IUCN; intervention benefits, use). These variables are marked with footnote b. Further details on variable coding are contained in Brooks et al. (2006).

that of Brooks, for comparability. Authors may not always be objective in their evaluations, but the reader cannot reliably know their bias, so we based coding on judgment of the source paper, not on our own views. For example, if one source reported long-term sustainability of livelihoods as economic success, whereas another reported limited short-term financial benefits as success, both would have been coded as successful.

Two researchers coded the same 25 studies separately, and we assessed their intercoder reliability by calculating Cohen's Kappa with the "irr" package (Gamer et al. 2008) in R version 2.6.0 (R Development Core Team 2007). We used Cohen's kappa to represent the proportion of agreement after accounting for the level of agreement expected by chance when coding categorical data (Cohen 1960) and Cohen's weighted kappa for ordinal data

Table 2. Variables used as indicators of outcomes of community-based conservation interventions and descriptions of what they represent*

<i>Outcome variable</i>	<i>Description of variable and coding</i>
Attitudinal	local attitudes toward the conservation intervention and conservation activities; three-level ordinal variable, ordered from failure (e.g., no changed attitudes and even creation of negative attitudes), to mixed effects (e.g., some evidence of positive attitudes or changed attitudes in a few), to success (e.g., significant positive attitudes in the population)
Behavioral	local behaviors of interest to conservation (either avoidance or alteration of destructive behaviors or adoption of new pro-conservation behaviors); three-level ordinal variable, ordered from failure (e.g., no behavioral change), to mixed effect (e.g., a few or limited behavioral changes), to success (e.g., significant change of behavior or change in the majority of the community)
Ecological	ecological outcomes of interest to conservation (either species or area based, depending on intervention goals); three-level ordinal variable, ordered from failure (e.g., decline or no improvement in ecological status), to mixed effects, to success (e.g., improvement in populations of interest or improved habitat diversity)
Economic	local economic outcomes influenced by the project, including community-level developmental benefits; three-level ordinal variable, ordered from failure (e.g., failure to improve income of any participants or failure to provide community-level benefits), to mixed effects, to success (e.g., significant improvement in income of majority of community)

*Assessments of failure or success are based on judgments made by each source, not by the coder, and where no information was available, a variable was coded as NA.

(Cohen 1968; Siegel & Castellan 1988). The first version of the coding protocol showed moderate agreement for the 15 predictors (mean $\kappa = 0.52$) and four outcomes (mean $\kappa = 0.41$). Nevertheless, a few predictors and outcomes had very poor reliability (minimum $\kappa = 0.118$). We tended to find less reliability with poorly described non-numeric variables, which required subjective interpretation by the coder, so we revised and expanded the protocol for these variables. When we could not rewrite the protocol to improve reliability, or where variables were dependent on infrequently reported data, we removed the variables from our study. For this reason, only certain aspects of culture could be coded, some of which were relatively broad (e.g., supportive local institutions). Community heterogeneity is thought to significantly impede local conservation management (Agrawal & Gibson

1999), but it could only be indicated through a proxy of community homogeneity, namely community size.

Based on our revised coding protocol, all 68 studies were recoded. We ordered categorization of all variables so that positive associations between predictors and outcomes indicated support for the hypotheses. We also coded the quality of measurement of each outcome, on a three-level ordinal scale from low to high, to check that outcomes reported were not biased by the quality of the reporting. There were no associations between measurement quality and level of success recorded, so we retained all 68 case studies for analysis.

Analysis of Predictor and Outcomes

To analyze each two-way association between predictor and outcomes, we followed Brooks et al. (2006). For each two-dimensional table, the degree of association was indicated by the Goodman-Kruskal gamma statistic (Goodman & Kruskal 1954). Gamma ranges from -1 to $+1$, and we coded our variables in such a way that a gamma closer to 1 indicated support for the hypotheses.

For each test statistic we calculated p with the Monte Carlo method, which is appropriate for small or heavily tied data sets (Agresti 2002). For each observed table, 5000 random tables were generated based on the assumption that predictor and outcome were independent but had the same row and column sums. For every random table, a gamma was generated and stored. The p value was calculated as the proportion of those 5000 random gamma statistics that were larger than or equal to the observed gamma (one sided because the hypotheses are directional).

Running multiple statistical tests raises the likelihood of accepting spurious associations as significant. Our use of 15 predictors and four outcome measures to generate 60 observed tables and test statistics was a potential problem. Therefore, we controlled for the false discovery rate with the procedure of Benjamini and Hochberg (1995). This procedure generates a q value to replace each p value in the q value package in R on the basis of the algorithms of Storey (2002), as per the procedure in Brooks et al. (2006).

Predictor Covariance

We expected that some of the predictors would covary. For example, projects that demonstrate greater adaptation to and engagement with local culture may also have greater community involvement in decision making. Therefore, for each pair of predictors we generated a Goodman-Kruskal gamma and Monte Carlo p value. Because we wished to identify all possible covariance (rather than conservatively test hypotheses), we did not replace these with q values. We also examined the structure of significant predictors with a categorical principal components analysis (catPCA) in SPSS 17.0 (SPSS 2008).

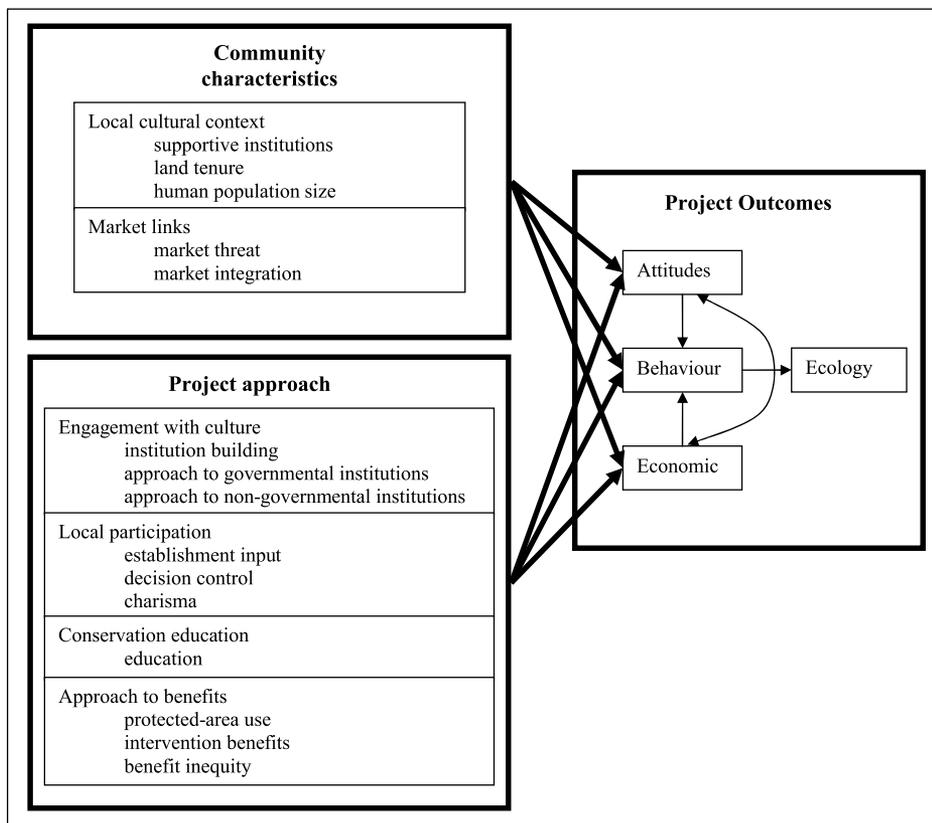


Figure 1. An overview of the variables measured in this study. Fifteen predictor variables represent different aspects of community and intervention (described in detail in Table 1), and the four different outcome variables represent different aspects of an intervention's effects (described in detail in Table 2).

The procedure reduces the dimensionality of the data into principal components (PCs), and the loading of each predictor onto each PC indicates its contribution. We retained the PCs that accounted for significant variance in the predictors by selecting those with eigenvalues > 1 . Missing observations were ignored in forming the optimal scaling of each variable, but were still used to scale other variables (Gifi 1990).

Results

Our final data set contained 68 case studies (Supporting Information), but because every study contained missing information, the effective sample size for each test varied from 27 (for the association of human population size and attitudes) to 64 (for the association of several predictors with economic outcomes). Of the 60 tests generated by exploring the effect of 15 predictors on four outcomes, 20 were associated with $q < 0.05$ and accepted as significant (Table 3). Control with q values means only one of these significant tests is expected to be a null case, compared with three had p values been used. All the significant associations were positive and thus supported the predictions of the hypotheses.

All outcomes were associated with an aspect of cultural context. Supportive institutions predicted successful behavioral and ecological outcomes, whereas devolved land

tenure predicted successful attitudinal and economic outcomes. In contrast, human population size had no effect. There was a strong effect of predictors indicating an intervention's engagement with its cultural context. Both institution building and engagement with nongovernmental institutions and shared values predicted success in all four-outcome types, whereas engagement with governmental institutions predicted success in all but economic outcomes.

Four other predictors were associated with outcomes. Successful attitudinal and economic outcomes were predicted by community control of day-to-day decision making (but not community involvement in establishment of the intervention or charismatic individuals), giving some support to the participation hypothesis. Projects delivering conservation education were positively linked with successful attitudinal outcomes. Finally, protected area use and increased market integration had positive associations with outcomes (behavior and economics), but there was no association with market integration, benefits generated by the intervention, or benefit inequity.

There were 17 significant associations between the nine significant predictor variables. The associations are conceptually plausible. For example, interventions that engaged with local governmental institutions were more likely also to show engagement with nongovernmental institutions ($n = 68$, $\gamma = 0.46$, $p < 0.05$). There were no strong associations (mean $\gamma = 0.45$), so no predictor's effect was completely subsumed by the effect of

Table 3. Significant associations, the four outcome types, and their predictors^a

Hypothesis	Predictor	Outcome type (γ , n)							
		attitudinal	behavioral	ecological	economic				
Cultural context	supportive institutions	-	0.58, 56	**	0.55, 41	*	-		
	land tenure	0.53, 46	**	-	-	0.46, 53	*		
Intervention engagement with cultural context	institution building	0.58, 52	*	0.45, 56	*	0.51, 41	*	0.43, 65	*
	approach to governmental institutions	0.56, 59	**	0.44, 56	*	0.58, 41	*	0.31, 54	<i>p</i>
	approach to nongovernmental institutions and shared values	0.47, 52	*	0.50, 56	*	0.83, 41	*	0.68, 64	**
Community participation	decision control	0.47, 51	**	0.32, 55	<i>p</i>	-	0.50, 63	*	
Conservation education	education	0.39 52	*	-	-	-	-		
Benefits and market integration	use of protected areas	-	-	-	-	0.63 50	**		
	market threat	-	0.45, 52	*	-	-	-		

^aPredictors that had no significant association with any of the outcomes are not shown. The association is measured by Goodman-Kruskal gamma statistic; gammas over zero indicate positive associations supporting the hypotheses.

* $q < 0.05$; ** $q < 0.01$; *** $q < 0.001$. The two tests where $p < 0.05$ but $q > 0.05$ are indicated with *p* and would have been accepted if conventional *p* values had been used.

another. The pattern of associations was confirmed by examination of the predictors with CatPCA (Table 4). All variables relating to cultural context and project engagement made a strong contribution to the first component. Although protected area use also contributed to the first component, the variables representing market-linked threats and conservation education did not. Conservation education was the sole strong contributor to the second component, whereas the third component was positively linked to market threats and protected area use and neg-

atively linked to project engagement with governmental institutions.

Discussion

There was a clear support for our first two hypotheses, that the outcomes of conservation interventions are positively affected by a supportive cultural context and engagement with the local cultural context. Our study also

Table 4. Loading of each variable that acted as a predictor conservation outcome onto the principal components (PCs) derived from reducing the dimensionality of the nine significant predictors with a categorical principle component (PC) analysis (Gifi 1990)^a

Hypothesis	predictor	Principle component ^b		
		PC 1	PC 2	PC 3
Cultural context	effectiveness of local institutions	0.546	-0.256	-0.221
	tenure	0.553	-0.324	-0.161
Intervention engagement with cultural context	institution building	0.658	-0.171	-0.170
	approach to governmental institutions	0.529	0.312	-0.504
	approach to nongovernmental institutions and shared values	0.504	0.453	-0.362
Participation	decision control	0.780	-0.376	0.236
Conservation education	education	0.176	0.851	-0.024
Benefits and market integration	use of protected areas	0.610	0.011	0.573
	market threat	0.384	0.455	0.628

^aThe variance of the predictors captured by the first three PCs could not be derived exactly, but are indicated by eigenvalues of 2.73, 1.575, and 1.268 respectively (only PCs with eigenvalues > 1 selected for analysis).

^bStrength of the contribution of the variable to the component. *, between 0.5 and 0.64; **, between 0.65 and 1.

provides limited support for the role of local participation, conservation education, benefit provision, and market integration.

Cultural Context

All four measures of intervention success were affected either by level of community tenure (attitudes and economics) or by supportiveness of other community institutions (behavior and ecology). Through our focus on local institutions, this supports our hypothesis that a supportive cultural context significantly influences intervention outcomes. Effective governing institutions can enable successful and equitable control of community activities and responsibilities, and local control of land tenure promotes individual security and concern for resources (Noss 1997). Similarly, resources can also receive protection from directly supportive nongovernmental institutions and shared values, such as traditional beliefs and taboos (e.g., Colding & Folke 1997; Madden 2004). These institutions and shared values can have powerful effects, but can act both for and against conservation goals. For example, a traditional preference for meat can significantly contribute to species declines (e.g., Wiles et al. 1997).

Project Engagement with Cultural Context

Two or three of the variables that indicated whether an intervention had adjusted to local society affected all measures of intervention success. This is strong support for our hypothesis that conservation interventions are more successful if they understand and respond to local institutions and culture. Interventions that ignore traditional values and beliefs are less likely to succeed (Stevens 1997), but some interventions in our study showed good cultural sensitivity. For example, in Guyana, *Arapaima gigas* fish are the subject of many beliefs, folklore, and taboos in traditional Makushi culture. Although taboos had become ignored, a partnership of local communities and national NGOs succeeded in influencing social norms so that informal social pressure made it unacceptable to overfish this species (Fernandes 2006).

Nevertheless, there were many other interventions in which cultural sensitivity was not evident or there was even direct conflict with the local community. For example, a management plan for Ambohitany Special Reserve in Madagascar made no mention of traditional village-level institutions. The NGO involved unwittingly suggested cooperation that cut across traditional frameworks for reciprocal work, conflicted with local land tenure, and inflamed existing disputes (Klein et al. 2007). Regrettably, there is no one-size-fits-all response to ensure that future interventions can better understand and adapt to society's institutions and cultures. It is very likely, however, that participation will help. Commentators agree that inadequate engagement with the perspectives and values of

indigenous people (Sharpe 1998) can produce interventions that are alien or incomprehensible to local people (Pujadas & Castillo 2007).

Ideally, institution building should be based in a society's existing rules and organizations (Ostrom 1990). Nevertheless, this is neither easy to do, nor an assurance of what one would regard as equitable outcomes; for example, many traditional societies marginalize women (e.g., Watts 2008). The literature from the fields of common property and development suggests that shaping equitable and effective institutions at the community level may take about a decade (Berkes 2004).

Participation and Education

Our results give some support to the hypothesis that greater community participation is associated with intervention success. Although devolving intervention design was not associated with success, community control of decision making during implementation influenced both attitudinal and economic outcomes. Furthermore, there were several associations between variables for participation and engagement with local culture. This provides some support for the claims in literature (e.g., Western et al. 1994), the systematic reviews of related topics (e.g., Salafsky et al. 2001; Brooks et al. 2006), and more-qualitative reviews (e.g., Sanjayan et al. 1997; Newmark & Hough 2000). Unfortunately, participation often falls short of the ideal, both in planning (Goldman 2003) and implementation (e.g., Musumali et al. 2007), so efforts should continue to facilitate community participation in conservation.

Nevertheless, participation is not a simple prescription for guaranteed success, whereby utopia is assured if communities have complete control (Adams & Hulme 2001). For example, a forest management intervention in Tanzania that was participatory and decentralized, yielded good ecological outcomes but inequitable social outcomes because resources and power were controlled by local elites (Friis and Treue 2008). Many interventions have fared worse. Generally, the distribution of authority across multiple institutions and levels is appropriate (Barrett et al. 2001), but exactly when and how it is appropriate to devolve power depends on the effectiveness of existing institutions (Borgerhoff-Mulder & Coppolillo 2005). Furthermore, participation did not predict behavioral and ecological outcomes, which are arguably the ultimate goal of conservation interventions.

We found some support for our last hypothesis; interventions providing community outreach and education about conservation were more likely to successfully change attitudes than those that did not. This supports the argument that information is necessary for people to become concerned about nature (Jacobson et al. 2006). Nevertheless, conservation education had no effect on the other three measures of intervention success. This

suggests interventions must address other drivers and constraints on behaviors before local participation and education can become linked with the ultimate measures of conservation success.

Benefits and Market Integration

Success was not predicted by interventions that had made greater efforts to provide communities with economic and practical benefits or by equitable delivery of benefits. Nevertheless, interventions associated with protected areas that allowed community use tended to do better than those that did not. This supports the idea that giving people use and control over natural resources encourages their concern for conservation of those resources. The effect of market links was also equivocal. Market integration did not predict any measure of conservation success, but interventions in which threat was in some way linked to commercial markets were more likely to generate pro-conservation behaviors. Resource users driven by commercial forces may have greater ability to switch behaviors than users driven by subsistence needs. Our mixed findings did not provide strong support for the hypothesis that benefit provision and market access can be important determinants of intervention success. This contrasts with previous reviews that support the role of market access and benefit provision (Salafsky et al. 2001; Brooks et al. 2006). In contrast to these studies, our study encompassed interventions that did not have strong development objectives. The implication of this may be that interventions asserting development goals must deliver practical benefits to motivate conservation support, whereas benefit delivery is less critical to interventions that do not emphasize development objectives. Mixed support for this hypothesis may also reflect that commercialization, market access, and access to technology have the potential to lessen the sustainability of resource exploitation, depending on the context.

Relationships between Outcomes

Our study was not designed to investigate the relationship between different aspects of intervention success. Nevertheless, we found a different (though similar) pattern of predictors for each aspect of success. For example, permitted use of a protected area did not affect attitudes, but it did predict economic outcomes. Time may change this pattern of outcomes (e.g., it may take time for positive attitudes to translate into behaviors). Different influences and constraints, however, operate on each outcome type. For example, it is well known that attitudes may not simply correspond with behaviors (e.g., Holmes 2003; Waylen et al. 2009). Therefore, studies that report on only one aspect of success cannot assume it translates into other aspects of success. Measurement of outcomes must be planned and justified carefully (Kapos 2009).

Systematic Reviews in Conservation

Systematic reviews provide a useful approach to evaluating conservation evidence to inform and improve debates in the conservation literature. Reviews that are based on larger sample sizes will be able to offer firmer conclusions and probe more-complex topics. In addition, it would be useful to study many other topics, such as the effect of external shocks or political instability (e.g., Glew & Hudson 2007).

Nevertheless, all reviews are limited by their original sources, and our sample size is small, although large compared with similar studies (e.g., Brooks et al. 2006). We concur with the many calls for more monitoring and reporting in conservation (e.g., Saterson et al. 2004; Sutherland et al. 2004). The reporting must also be of higher quality because some of the papers we viewed failed to describe even basic details, such as a project's start date. Poor-quality data limit variables that can be coded. For example, human population size is not an ideal indicator of social heterogeneity. Every paper presents a version of reality constructed to convince a reader, and there is probably a general tendency to under report failure (Knight 2006). These problems can be tackled by careful planning so that monitoring is an integral part of implementation and so that the data reported are relevant, objective, and quantified where possible (Nichols & Williams 2006).

Even if conservation evidence is provided in greater quality and quantity, systematic reviews may be well complemented by traditional reviews. Certain types of data that require subjective interpretation are problematic to code for a systematic review. Even if a protocol can be revised repeatedly, individual coding decisions may still differ. Furthermore, chains of causality between relevant variables are likely to be multiple and complex. At this time the conservation literature does not permit creation of the large data sets that are needed to build complex statistical models required to analyze these interactions quantitatively, although Bayesian methods may help (Ellison 1996). In such situations the strengths of traditional reviews (Baumeister & Leary 1997)—which can incorporate expert knowledge, exploit the richness of narrative content, and untangle complex patterns of causality—make them powerful complements to systematic approaches.

Conclusion

Our results provide clear support for the arguments that conservation (and hence conservationists) needs a better understanding of and adjustment to the "community" in CBC (e.g., Spiteri & Nepal 2006). We found more evidence to support this than to support the argument that success depends on economic benefits or market links.

This is an important and controversial finding that requires further investigation. It is not easy to promote understanding and appreciation of local culture, although local participation is likely to be a mutually supportive activity. Nevertheless, it is necessary to try because so far the reluctance to view conservation as a social and political process has led to many failures (Brechin et al. 2002). Conservation practitioners need to better embrace expertise from the social sciences and development sector, which have been confronting these challenges for much longer than conservation (Campbell & Vainio-Mattila 2003). The cultural context of conservation matters, but recognizing this will be easier than responding to it.

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Supporting Information

A list of the 68 community-based conservation interventions used in this study, with sources (Appendix S1), is available as part of the online article. The authors are responsible for the content and functionality of this material. Queries (other than absence of the material) should be directed to the corresponding author.

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