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Inclusive Protected Area Management in the Amazon: The Importance of Social Networks over Ecological Knowledge

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Received: 3 September 2012; in revised form: 5 November 2012 / Accepted: 16 November 2012 /

Published: 30 November 2012

Abstract: In the Amacayacu National Park in Colombia, which partially overlaps with Indigenous territories, several elements of an inclusive protected area management model have been implemented since the 1990s. In particular, a dialogue between scientific researchers, indigenous people and park staff has been promoted for the co-production of biological and cultural knowledge for decision-making. This paper, based on a four-year ethnographic study of the park, shows how knowledge products about different components of the socio-ecosystem neither were efficiently obtained nor were of much importance in park management activities. Rather, the knowledge pertinent to park staff in planning and management is the know-how required for the maintenance and mobilization of multi-scale social-ecological networks. We argue that the dominant models for protected area management—both top-down and inclusive models—underestimate the sociopolitical realm in which research is expected to take place, over-emphasize ecological knowledge as necessary for management and hold a too strong belief in decision-making as a rational, organized response to diagnosis of the PA, rather than acknowledging that thick complexity needs a different form of action. Co-production of knowledge is crucial for governance, but mainly not for the reasons for which it is promoted.

Keywords: protected areas; knowledge; co-management; Colombia; Amazon basin

1. Introduction

Although different academic discourses and technical guidelines on protected area (PA) management can be found today, both in academic literature and in normative guidelines, it can be said in general terms that there is a more or less widespread turn to acknowledging the social dimension of the territories and their ecological complexity. Community-based management, co-management, adaptive management and the more recent adaptive co-management are examples of these tendencies in academic literature [1–3]. Regarding management guidelines, the inclusion by the IUCN of management categories V and VI is an example of the acknowledgement of the relationships of people with nature as valuable for conservation [4]. This turn has many dimensions (for instance, a change in the role assigned to the State in conservation); the one we will explore here is related to what is regarded as pertinent knowledge for conservation; to how it is generated and to how it is expected to inform decision-making.

In the conventional PA management model, also known as the “Yellowstone model”, knowledge for conservation decision-making is mainly expected to be produced by natural-scientific experts, based on what Holling called “the analytic culture in ecology”—characterized by simple causality, focused on a single scale, using classical statistics and searching for a precise truth [5]. In this conventional model, expert knowledge is expected to flow uni-directionally to the decision- and policy-making arena, where it is implemented through command-and-control methods. This mechanism, identified as the “transfer and translate model” [6] or as “push-and-pull” interventions [7] is characterized basically by its one-directional flow between knowledge and action.

Seen from a more critical perspective, this process of knowledge production can be regarded as “simple rationality” [8]: the world is isolated from the process of knowledge production and reason guides research on a mechanical, causal nature that can be reduced to its parts and understood by experts. Such an objectively produced and reliable knowledge informs and legitimizes political action, in what Funtowicz and Strand call the “modern model” [9]. As we will try to argue, our results suggest that more recent “complexity-aware”, inclusive PA management ideals share some of the characteristics of this simple rationality and, in more general terms, can be said to be still partially embedded in a modern model.

The conventional model of natural resources management has been questioned from two interrelated perspectives: non-equilibrium ecology and a growing awareness—stemming from both social and ecological research—of the need to conceive people and nature as part of the same system [10–12]

From the perspective of non-equilibrium ecology, normal expert scientific knowledge’s ability to deal on its own with unpredictable, emergent, multi-scale systems is questioned [11,13]. Besides needing methodological transformations—from an analytic to an integrative approach [5]—non-equilibrium ecology calls for the inclusion of different disciplines and stakeholders in the production of knowledge. In co-management schemes, where both complexity and “people-in-nature” approaches merge, dialogue between forms of knowledge is considered crucial [3,14]. According to Berkes [3], “Knowledge for dealing with ecosystem dynamics, resource abundance at various scales, trends and uncertainties, is dispersed among local, regional, and national agencies and groups” [3].

Ways to promote this dialogue vary significantly and are often confused and contradictory, both in conceptual and methodological terms [6,15,16]. Participative monitoring and research, which include

local communities as “equal partners” in order to widen the range of available information and design pertinent management strategies, are a way to promote such co-production of knowledge. Another example of co-production of knowledge are place based learning communities, where local research projects, aimed at dealing with local problems, are supported through capacity building and collaboration around the construction of locally relevant knowledge [17].

Many of the methodological and epistemological difficulties implied in knowledge co-production and how to deal with them have been discussed in the literature, such as the conflicts between scales and value-systems implied in different knowledge systems (for instance, Huntington [18], Hill and Coombes [19], Cundill, Fabricius and Marti [15] and Cash, *et al.* [20]). Also in this context, power differences are often mentioned as a dimension to be dealt with: scientific knowledge is often an instrument for reinforcing the powerful stakeholders’ worldviews and decisions on the territories [21–23]. Also, there have been calls to the explicit acknowledgement of the political load of scientific concepts and methods, which would imply questioning the scientific input to such dialogues, being explicit about its value-load and opening it to collective scrutiny [24–26].

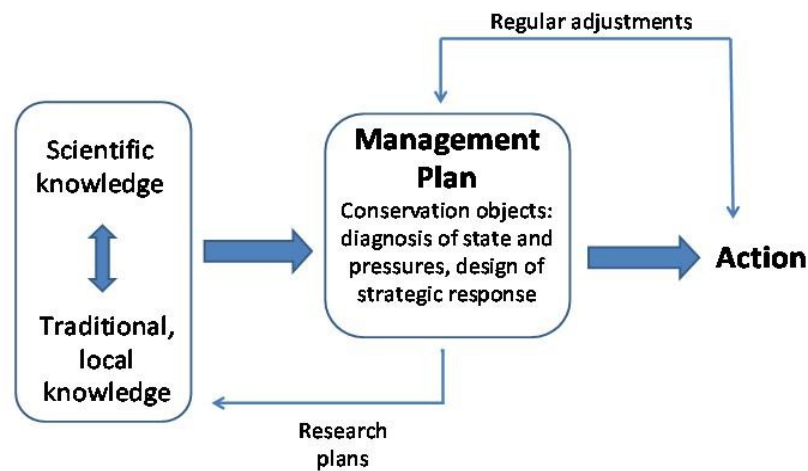
In this complexity-aware arena, transdisciplinary knowledge is expected to inform decision-making in an adaptive circuit. In adaptive management, decisions are treated as hypotheses and adjusted according to their performance, which seems more appropriate in the face of unpredictability [10,13]. Also, some authors, calling attention to the fact that management has to respond to socially desirable states of socio-ecosystems, promote adaptive management around socially constructed scenarios. In this context, the role of experts would be to describe the possible futures for the managed social-ecological systems [27,28].

More recently, in the context of adaptive co-management, attention is being called to learning as a crucial process for decision-making [29], which has been defined as the change in the collective understanding of a problem, as a result of social interaction [30]. For successful co-management, social networks in which this self-organized learning takes place and the ways in which it is transmitted and stabilized are key [31]. Although there is a growing interest in learning in the resource management literature [32,33], it is difficult to find management guidelines where learning is made visible and promoted in an explicit manner, as ecological knowledge production is.

Also in the Colombian conservation arena, changes towards inclusive governance have taken place, mainly as a result of a national tendency to acknowledge Indigenous territorial rights (as reflected, among others, in the National Constitution of 1991) and also in accordance to international conservation trends and agreements. Initiatives in this respect are promoted by NGOs and the State: the currently in force “Parks with the People” national conservation policy, which advocates for sharing power and defining conservation objectives jointly with local communities, is an example of this trend [34].

Although contested and differentially interpreted at different levels of the institution and regions of the country, the guidelines for PA management (that resulted from a technical interpretation of the aforementioned policy) can be schematized as shown in Figure 1.

Figure 1. A schematic version of the management model that was adopted by the Unidad de Parques Nacionales of Colombia (UNPC) for implementation by National Parks.



This model incorporates some of the assumptions of inclusive visions of protected area management mentioned above. For instance, the management plan is expected to be regularly revised, in an adaptive mode. However, the feature that we wish to explore here in some depth is the collectively produced knowledge as an input for action. In Amacayacu National Park, as we shall discuss in the following sections, there were different scenarios that were a fertile ground for producing such an input.

Below, we describe Amacayacu National Park (ANP), the Amazonian PA where we carried out our research, and the methods we used. In the third section, we describe some of the difficulties faced by the initiatives for collective production of knowledge in ANP. In the fourth section, we present a description of the knowledge-action circuit that is functioning in the Park and revise the apparent failure of the co-production initiative. Finally, we discuss the significance of our findings in terms of current understandings of inclusive protected area management.

2. Study Site and Methods

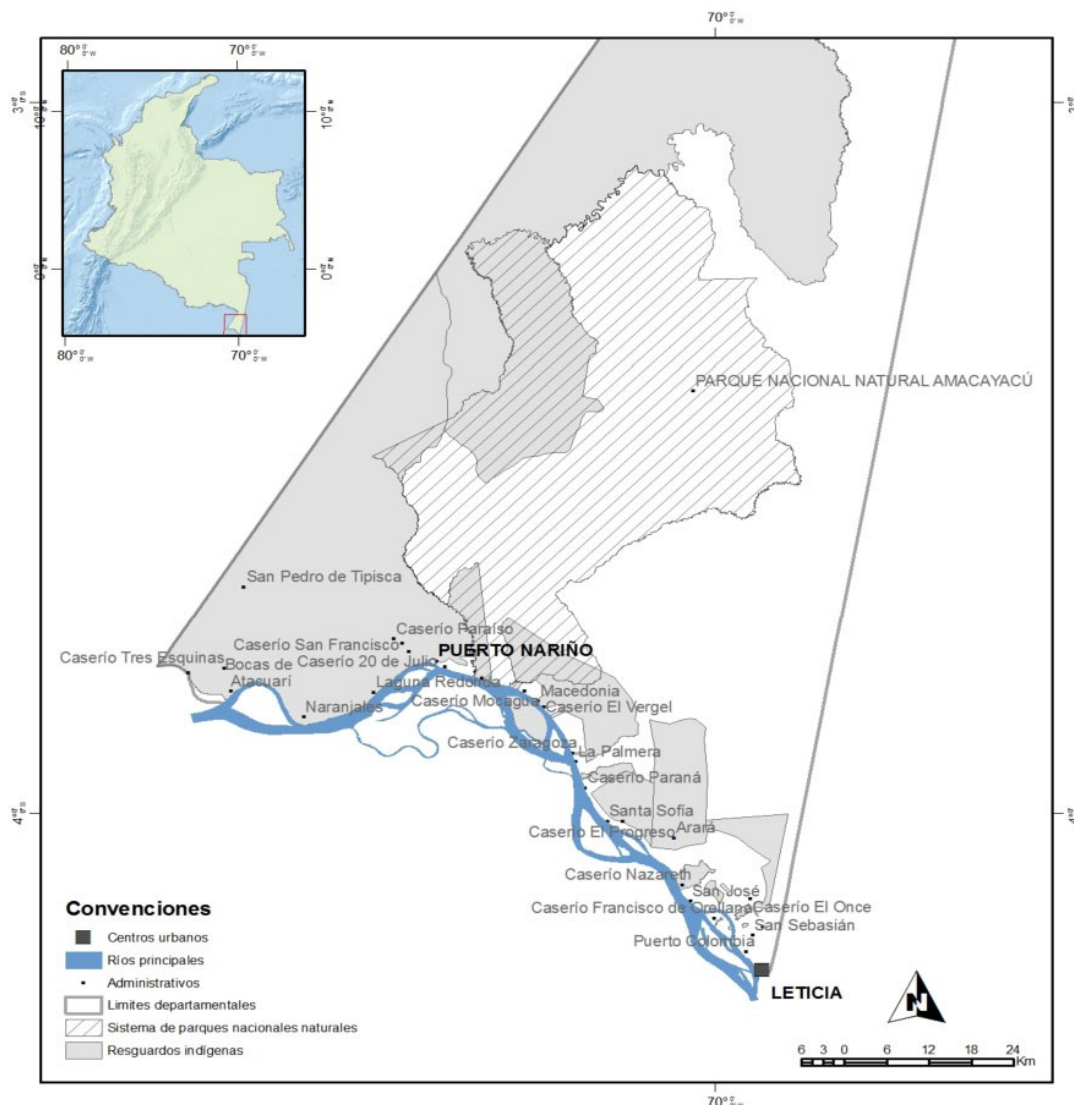
2.1. Amacayacu National Park

Amacayacu National Park (ANP) is one of the 17 national parks of the Colombian Amazon region and one of the 56 Colombian national parks, which together cover 13% of the country's continental surface. They are under the authority of the Unidad de Parques Nacionales de Colombia (UNPC), a relatively autonomous part of the Ministry of the Environment and Sustainable Development. There are five to 15 members of staff employed at the local level (a variability that is a consequence of the high proportion of short-term contractors). The Park's offices are located in the Southern part of the Park and in Leticia, the biggest city of the Colombian Amazon (aprox 70.000 inhabitants), one hour away from the Park facilities by boat.

ANP was declared in 1975, and it covers 293,500 hectares of lowland tropical rainforest in the extreme Southern Colombian Amazon (Figure 2. Map of ANP). Climate is typical of lowland tropical

rainforest, with over 90% of air humidity and a mean annual rainfall of 3200 mm. The level of the Amazon River varies greatly (by up to 11 meters) between January and July. The region's ecosystem and species richness is very high for national and international standards, with reports of over 980 bird species, 195 terrestrial mammals and 4500 vascular plants [35]. The woody plant species richness of the Southern Amazon region of Colombia is one of the greatest of the whole Amazon basin [36].

Figure 2. Map of Amacayacu National Park



In its Southern sector, 12% of the Park territories coincide with legally recognized Indigenous territories inhabited by approx. 5,000 persons, mostly from the Tikuna ethnic group. Decisions regarding shared territory have to be agreed upon with Indigenous authorities. These local communities can be said to be among the least “traditional” in the Colombian Amazon, living close to the city of Leticia and market economy. Most of them do not speak Indigenous languages. However, livelihoods are still largely based on collective work, depending on the products of traditional orchards, fishing and hunting and the selling of handicrafts to tourists who visit the Park.

ANP is one of the most visited national parks in Colombia due to its accessibility and relative political stability, and it enjoys a well-established infrastructure for tourists and researchers. It is one of

the Colombian PAs where more academic research projects have been carried out (between 1998 and 2008, it housed over 10% of the total number of research projects that were carried out in the same period for all 56 National Parks) and also one of the few Colombian National Parks where co-production of knowledge and Indigenous research have been systematically promoted and documented. Despite occasional illegal logging and mining activities, it is a “very well conserved area”, according to an institutional evaluation of effectiveness carried out in 2007 [37].

2.2. Methods

This study is based on ethnographic work performed in two periods by the first author: in 2003–2005, when she worked with the Dutch NGO Tropenbos to support its work on problem-oriented research in ANP; and then in 2007–2009, when she was in charge of the Research Program of National Parks, employed at the national offices of the UNPC. During this period, she carried out participant observation in her everyday undertaking, registered in field notes of events, conversations and observations. Five workshops that dealt with the issues of management planning and pertinent knowledge were selected for analysis, two of which were carried out in ANP with local stakeholders. In the other three, staff of this and other Amazonian National Parks took part around the same issues. Also, six focus groups for deepening this issue were organized, with the participation of staff from the local, regional and national levels of the National Parks and of NGOs, of other organizations’ representatives and of academic researchers. Sixteen semi-structured open interviews were carried out. Selection of interviewees was based on previous participant observation in order to include key persons from different levels and organizations. Questions were adjusted in the course of the interview, but they all dealt with issues such as interviewees’ everyday undertaking, their relationships with other stakeholders at different levels, their perception of formal planning instruments and the role of different forms of knowledge in their actions. Thirteen documents were selected for analysis in order to account for the wider historical and geographical context of PA management in Colombia and in the Colombian Amazon. These included unpublished technical documents, reports by different organizations and proceedings of meetings.

Ethnographic information, interviews and documents were analyzed manually following the basic principles of grounded theory [38]: stakeholders’ problems and ways to deal with them were investigated systematically without formulating a priori hypotheses. Codes were identified that emerged from the data, and they were later grouped in categories and subcategories. Empirical content in each category/subcategory was identified in the material and then systematized in order to recognize emerging schemes. Initial categories were: relationship between knowledge and action; implementation of strategies, plans and guidelines; practical problems of the stakeholders; and ways to deal with difficulties.

Throughout this investigation, we refer to networks as system made of people, groups of people and components of nature that are interconnected in different ways (through flows of information or resources, by emotional or value ties). We do not refer to social networks as defined in the social network analysis literature and we did not conduct any quantitative analysis, as has been done elsewhere for governance and environmental management (see for instance [39]).

3. Problems Implementing the Model: Difficulties in the Dialogue between Forms of Knowledge

In order to analyze how co-production of knowledge was carried out in ANP, we addressed three arenas in which it was promoted: local research projects, formulated and implemented jointly by Indigenous people and park staff; projects proposed by academic researchers, which were expected to be adjusted through deliberative processes with Indigenous people and carried out jointly; and the collective identification and prioritization of Conservation Objects for the management plan.

3.1. Local Research Projects

Since the 1990s, long before the formulation of a management plan for ANP (which took place in 2004), collective research projects have been formulated by Indigenous people and Park staff, projects that are expected to serve both conservation objectives and Indigenous people's economic interests. At the beginning, these were aimed at establishing small-scale sustainable production industries. In 1999, with the arrival of the NGO Tropenbos, which had experience on collective and Indigenous research in other parts of the Colombian Amazon, and the support of a biologist based in ANP, the communities continued formulating what were then called "Proyectos propios" ("Own projects"). These projects were oriented towards monitoring of fauna and the production of local cartography, implied the co-production of social-ecological knowledge and were therefore expected to inform management decisions. Some of these projects obtained financial support of national agencies.

These local research projects, in which Indigenous people registered information on fishing and hunting and established agreements on these activities, generated numerous collectively crafted maps of the territories and detailed information about places and times of fishing and hunting. They were also expected to generate information for Indigenous and PA staff decision-making, for instance, on times and places where these activities were to be allowed. Although they were mentioned by both staff and Indigenous people as very important projects, such a use of information was not reported; the formal agreements on restrictions to resource use were only ephemerally implemented, lasting only as long as there was financing for the salaries of the participants that were in charge of surveillance. Also, lack of clarity about the subsequent use of locally-generated information, which arose suspicions among Indigenous members of the group, was a source of conflict and a reason given to explain the short life of these projects. Similar situations were mentioned for other Amazonian Parks, where initiatives of local monitoring of natural resources were carried out, where the processes of participative monitoring were regarded as very valuable, but the results of which were not explicitly used as input for decision-making.

3.2. Academic-Staff-Indigenous Interactions in the Local Working Group on Research

With the methodological and financial support of Tropenbos, a "Local Working Group on Research" (LWGR) was in function throughout the period 2001–2006. This group was formed by a representative of each of the five Indigenous communities present in ANP or its surroundings, a representative of ANP staff and often a volunteer from Tropenbos. Besides carrying on with the "Proyectos Propios", the group was expected to discuss and adjust academic research projects planned

for the Park,. Such discussions were expected to re-orient the projects to address local questions, include local knowledge or involve local co-researchers.

The LWGR, as explained by the Director of Tropenbos, was expected to be, “a platform for dialogue (...): for identifying what the others have, what they know, what they need. It was conceived as a mechanism for debating and supporting proposals from different sides (academia, ANP and Indigenous)¹.” However, the LWGR became a rather bureaucratic space in which academic researchers’ permission for entering Indigenous territories was discussed and where negotiations about financial issues took place, such as on the number of Indigenous people to be hired in research projects and their salaries. There were virtually no discussions on the objectives or the conceptual or methodological characteristics of research projects.

Despite the intentions that were in the origins of the LWGR, in practice, it became a scenario where historical lack of trust between Indigenous people and researchers and between the latter and Park staff emerged. As one Indigenous member of the group stated in an interview, “All our lives we will be watching how others come and do research on us, and when our children grow up there will be nothing left to investigate.” Also, for many academic researchers, the presence of Indigenous territories in the Park and the insistence of local staff in promoting prior consultation of projects became a significant obstacle for scientists’ undertakings. In some interviews and group discussions, we found a prejudice among researchers towards local staff, according to which they were not trustworthy because of their bureaucratic mentality and their eagerness to show their power. One PhD researcher stated: “(Local personnel have) the superiority complex of a doorman who sees himself as the owner of the building.” Local staff, on their side, often referred to academic research as a distant, inaccessible activity, carried out by “some advanced and chosen”, who were scarcely interested in making their results useful for management problems.

Although the LWGR could in principle be regarded as fertile ground for the co-production of relevant knowledge, we could observe no reference to new knowledge on ecological attributes of the Park as a product of the Group that had actually been used for formulating the management plan or for decision-making. However, it is important to note here that from these meetings and later field work, significant friendships between academic researchers, staff and Indigenous people emerged, and some Indigenous members of the group became leaders of their communities and kept being important allies of ANP staff for other joint issues. We shall return below to the question of the importance of this group for strengthening social networks, building trust and redistributing power, and for the moment merely note, as a sign of the importance of the processes that took place in the LWGR, how all of the involved stakeholders regretted the dissolution of the group in 2009.

3.3. Participative Definition of Conservation Objects

A third agenda that entailed participatory processes around knowledge production was the identification and prioritization of Conservation Objects (COs) for the Management Plan. According to the then in force guidelines for formulating management plans, COs are the elements that are expected to be used for making a diagnosis of the conservation state of the Park and the pressures that threaten

¹ Statements between inverted commas are direct quotes from transcribed interviews, workshops or focus groups.

it, and management decisions are supposed to be planned and then implemented as a result of this diagnosis. COs can belong to one or more of the following categories: Attributes of biodiversity (e.g., ecosystems, population or species), ecosystem services and “natural attributes of cultural and historic value”.

PA staff was expected by the central offices of UNPC to formulate first an “institutional management plan”, which implied the selection of its conservation objects and a description of their state and of the pressures to which they were subject, based on a revision of the academic research that had been carried out in the Park. This stage of the process could be regarded as a first attempt at carrying out a dialogue between academic knowledge and management needs, in as far as it implies an understanding of academic knowledge by local staff. Then, this institutional plan was to be adjusted with other stakeholders. The park staff carried out seven workshops and numerous meetings with academia, NGO and Indigenous communities between 2003 and 2004 for this purpose.

Already in the first stage of definition of COs, it became clear to ANP staff that the available scientific research did not serve management needs, not even for the diagnostic stage. For instance, a revision of existent literature on ANP did not provide a general outlook on biodiversity in the area, because more than 90% of the studies had been carried out in the Southern (more accessible) part of the Park; most research was performed in very limited time frames, with incompatible methodologies, and about particular species of academic interest, which impeded generalizations about, for instance, keystone species, their uses or the threats to which they were subject. Therefore, the park staff ended up defining a preliminary list of COs based mainly on, “what they knew, what they thought to be important,” as a way to comply with the requirements of the management plan and, “To have something to bring to the participatory exercises,” prescribed in the guidelines for formulating the management plan.

However, the main difficulties found by ANP staff for identifying and prioritizing COs, and for advancing participatory processes with local communities in order to adjust their list of priorities, were related to the notion of CO itself and its incompatibility to what they defined as management priorities. While COs are implicitly defined as a limited list of “objectively” defined biological or cultural components of the Park, management priorities (in terms of protection, monitoring and negotiation) for Indigenous people, as well as for ANP staff, were different: they were constituted by temporally and spatially dynamic and social-natural components of the territory. Multifunctional traditional orchards, game or medicinal groups of species are examples of such practical priorities (over, for instance, an endangered or a charismatic species, as defined by conservation biology).

More importantly, these priorities were regarded as such because they were *valued* by local communities. In fact, some years later, as a result of their experience in identifying COs, Amazonian Parks staff proposed alternative guidelines for formulating management plans, based on what they called “Integral Conservation Priorities”, which are biodiversity elements prioritized using criteria of local use and shared value, among other criteria [40].

Moreover, as will be further described and discussed below, particularly in Sections 4.2 and 5.2, what was regarded by local staff as crucial for governance of ANP was not so much the knowledge on these valued components (which was in fact produced by many academic studies, but generally not regarded as useful by local stakeholders), but the collective process of investigation through which

both staff and local communities learned from each other and from each other's history, interests and values, among other relevant results.

At the end of this participative process, a list of COs was produced for the management plan, but it was regarded, as the management plan in general terms, as a formal requisite for that document, that had little or no effect on management decisions. This was stated in similar terms by most members of local and national staff, both in interviews and in focus groups. Action in the Park, as reported by a member of local staff, "kept being carried out as it had always been".

4. "Management" of ANP and the Knowledge that Informed It

Our empirical research of the ANP strongly indicated that the circuit of informed management was not taking place as established in the ideal model (illustrated in Figure 1). Specifically, the use of scientific and/or co-produced knowledge for informing planned decisions was not evident. Still, the park has been assessed as a "very well conserved area", according to institutional evaluation based on both ecological and institutional indicators [37], a description that we do not object to. Accordingly, we were led to reconsider the apparent "failure" of co-production of knowledge experiments to cast a critical light on some of the theoretical idealizations on how management of PAs is and should be conceived in inclusive management models.

4.1. Re-Thinking Action and Pertinent Knowledge

Throughout our interviews and observational studies, we have analyzed how local staff of ANP themselves describe their own activities. They consistently did so in a way that allowed us to group these activities in two categories: reactions to crises and constant activities that have been carried out since the origin of the Park. Crises, called by local staff "junctures", can be defined as the unexpected emergence of propitious or unfavorable circumstances whose origin lies outside the field of control of ANP staff and that needed immediate attention. Some crises originated in illegal activity, such as the sudden entrance of loggers into the park. Other crises stem from closer surroundings of ANP, such as unexpected changes of political representatives of Indigenous communities. Requirements of the UNPC national office to implement new planning or evaluation instruments in reduced times or unexpected decisions on budget allocation made by the national office were also perceived at the local level as junctures. Actions consisted, in these cases, of reducing the impact of such crises, for instance, recurring to the confidence of allied providers of the much needed gasoline for motorboats in the presence of a sudden budget reduction. Alternatively, crises could also be turned into opportunities, for instance, through involving new stakeholders from other organizations for confronting together illegal logging, stakeholders that would later remain as allies. These are but a few examples that demonstrate how the capacity to deal with junctures is highly dependent on the strength and flexibility of social networks around ANP.

Other lines of work developed by local staff were constant, carried out since the origin of the park, and responded to historical ecological and institutional dynamics. Supporting local communities in their search for income is a good example of this kind of activity. Local staff has worked to involve Indigenous people in tourism in several ways. Also, local staff has supported local communities in the formulation of and fundraising for projects for the establishment of domestic manufacturing based on

non-timber forest products. Other examples of constant activities are: environmental education, carried out in local schools and with elderly people as trainers; meetings with local authorities for establishing agreements on resource extraction; attendance to researchers, who have been conducting research in ANP since its establishment, and the control and surveillance activities, mainly consisting of accompanying local monitoring activities. Also, the communication with the Central Office, responding to constant requirements on administrative issues, was considered, “Part of our daily life.” Such constant activities can be seen as a way to maintain, strengthen, generate or re-orient multi-scale and multi-level social ecological networks, which are key to being able to react to crises.

In this circuit, the management plan did not play an important role as the instrument for organizing informed activities. As mentioned above, its elaboration, which took place between 2003 and 2004, was perceived by local staff as a task imposed by the central office, a job that needed to be done for fulfilling a requirement. In interviews, workshops and focus groups, members of local staff stated in different manners that action at the local level kept being carried out in the ways in which it was being done before the plan existed.

Thus, action in ANP was not guided by a diagnosis of the state of and pressures on components of the biological systems, systematized in a management plan in order to design responses. Rather, what was crucial was the (non-documented) knowledge of the functioning of multi-scale social-ecological networks and of the associated values of different stakeholders. Knowledge and abilities for mobilizing stakeholders at the local level (who, when and how to convene on different kinds of meetings, for instance), which also implies knowing which features of the ecosystems are valuable for them (as mentioned in the previous section) or on how to deal with the requirements of the upper levels of the same or other organizations (without abandoning local priorities) are examples of the kind of knowledge that was constantly mobilized for decision-making. This kind of knowledge was said to be acquired through individual experience, collective processes and personal abilities.

This form of management, a combination of actions at different temporal and spatial scales that requires both knowledge of the emergent complex social-ecological system and particular abilities, is evidently different to command-and-control, but it does not coincide either with the idea of adaptive co-management, defined as a systematic, collective trial and error exercise around explicitly agreed-upon objectives and actions. This way of acting is similar to the metaphor that Delgado and Strand used to describe their vision of environmental governance: A complex dance, in which dancers adjust their movements to rhythmic or abrupt movements of others and whose functioning depends greatly on trust, dependency and opposition [41].

4.2. Rethinking the Process of Knowledge Co-Production. Really a Failure?

In section 3, we described what could be defined as a failure of co-production of knowledge, from the point of view of the management model that was supposed to be implemented (Figure 2): Locally formulated research projects were short-lived, and the information they generated was not translated into the management plan or into explicit decisions; the efforts for adapting academic research to include local needs and knowledge resulted in a scenario for political and financial negotiations, and it was not possible to arrive upon a list of agreed-upon Conservation Objects that would actually orient management decisions in ANP.

However, when analyzing the actual knowledge-action circuit that was taking place in ANP, this apparent collapse can be understood differently. While not through the idealized mechanisms, *i.e.*, while not generating products for the management plan, the described exercises for co-production of knowledge did have an important impact on the governance of ANP and, therefore, on its conservation. Specifically, these activities contributed to creating and strengthening long-term relationships between stakeholders, to building of trust, to power re-distribution and to social learning, at multiple scales and levels. All these variables have been considered vital for establishing a resilient social-ecological network [20,32,42].

For instance, Indigenous participants in the LWGR were later elected as political leaders of their communities, leaders with which a more fluid relationship with the Park's staff was possible; accompanying local research projects and doing consultation of COs permitted park's staff to know better the territory and local natural resource uses and allowed Indigenous people to understand the practical problem of State conservation.

5. Discussion: Enduring Idealizations and the Actual Contribution of Co-Production of Knowledge

We support notions of inclusive park management as improving on earlier command-and-control approaches, in particular in settings such as our case study, notably where a natural park also is the home of human communities. However, the purpose of this paper has been to show how also these “inclusive” notions retain some of the old idealizations on how PAs actually work. In this section, we will discuss these idealizations further.

We have described above (see Section 3.1) the efforts made in ANP for including knowledge from various sources for conservation decision-making. Although these initiatives had important consequences for governance, as indicated in Section 4, it can be said that they failed in terms of the objective of generating relevant knowledge for explicitly informing decision-making.

This apparent failure can be explained in terms of two idealizations on how PAs actually work that, as we shall argue, are shared by both conventional and more inclusive PA management models. The first one has to do with an underestimation of the political and historical scenario in which any kind of production of knowledge takes place. The second one is related to an understanding of “informed decision-making” as a rational process, based on a diagnosis, oriented by clearly stated objectives and implemented through strategies.

5.1. The Role of the Sociopolitical Context

One of the implicit simplifications shared by a number of both conventional expert-driven and more inclusive/democratic models for informed management (which we believe is made visible by this case-study) is their lack of emphasis on the political and historical context in which the production and use of knowledge takes place. Regularly, co-production of knowledge is portrayed as an explicit dialogue around questions, methods or values, as in scenario planning [43,44] or in extended peer reviews proposed by post normal science [9]. Problems related to co-production of knowledge for environmental management are approached, focusing on epistemological or methodological issues, such as scale mismatches between knowledge sources [20]; the selection of conceptual frameworks for transdisciplinarity [15] or differing documenting methods for traditional and formal knowledge [18].

In this case-study, however, the political and historical context of the documented processes played a central role, hindering and rendering irrelevant the use of scientific knowledge, both as an instrument for the legitimization of powerful stakeholders' decisions and as an input for a dialogue between understandings of nature. Multiple prejudices and differences in practical problems among involved stakeholders hinder an open dialogue around technical issues or even values. According to the Gini Index, Colombia is the fifth most unequal country in the region [45]. Only 0.5% of the total population has access to higher education [46]. Researchers in National Parks are thus part of a very small minority of the Colombian population. Less than half of National Park's staff at the national level belong to this minority, most of which work in urban offices. In each NP, only the chief and a "supporting professional" have a university degree. Most staff belong to ethnic minorities of the regions where the Parks are located; less than 15% of the population of these groups have even completed primary education in Colombia [47]. In the empirical parts of this paper, one may see traces of this context, for instance, in the way that park management above all becomes a task of building relationships based in trust and at least a partially common understanding about the knowledge and action required in the protection of the area.

The interaction between local communities and "white" people (staff and researchers) is also loaded with tensions related to, among other issues, a historically unequal relationship between colonizers and colonized peoples [48,49]. In the Amazon, this relationship has been based on the exchange of commodities, in which Indigenous people's ability to negotiate has been crucial for their survival [50]. Also, the present political conflictive framework of access to traditional knowledge plays an important role in mutual prejudices [50]. In more general terms, the relationship between white and Indigenous people is conditioned by claims related to economic and territorial rights of Indigenous people, which tend to politicize any dialogue [19].

Public response to science depends more on the perception that relevant actors or institutions have of each other, on their mutual trust, than on the understanding of information [51]. Therefore, the shortcomings (in terms of knowledge production on the science-society interface) in the dialogue between local staff, Indigenous people and scientific experts described here is understandable in a context of mutual prejudices and lack of trust, as illustrated mainly in Sections 3.1 and 3.2. However, the argument goes both ways: indeed, in a context in which trust is a critical but fragile resource, it is also reasonable and desirable that occasions for social interaction develop into opportunities to build trust.

Another dimension of knowledge production that tends to be ignored in both conventional and more democratic models of PA management, which emerged in this case study, is the implicit politics of scientific knowledge.

On the one hand, scientific knowledge on ANP biodiversity that was available for Park staff was geographically, temporally and thematically biased. This bias responded to the accessibility of places and to the interests and financing of researchers. Such a bias is not exclusive to ANP; knowledge on biodiversity is correlated worldwide, among other factors of political origin, to economic development indexes [52] or to personal and institutional interests [53,54], rather than to its natural distribution. In other words, academia describes a thin "slice" of biodiversity, the slice that allows researchers to increase their "credibility capital" [55], to have a place in the biodiversity globalocentric network [56]. What this case-study suggests is that this slice does not coincide with what PA managers would need to comply with management guidelines, such as the identification of Conservation Objects.

On the other hand, the CO concept itself often clashed with both management and Indigenous priorities, which integrate social and natural attributes and are dynamic in space and time, as illustrated in section 3.3. These features of social-ecological systems have been pointed out by non-equilibrium ecology, and it has been argued that they need to be assumed by PA management [2]. It has also been argued that the affinity of non-equilibrium ecology notions with Indigenous perspectives allows a more fluid communication between these knowledge systems [57,58]. Therefore, the clash between the CO concept and management needs could be attributed to the former's lack of consideration of non-equilibrium ecology insights. However, according to this case-study, priorities that were actually used for the governance of ANP were components of the system that were also *valued* by local communities. We would argue, along with other authors [19,59,60], that even if co-production of knowledge was to be carried out around non-equilibrium ecology concepts, it would still fail if it did not recognize the wider political context in which knowledge is immersed, a context that is fundamental for the meaningful, pertinent construction of knowledge. As mentioned earlier, Integral Conservation Priorities were proposed by Amazonian Parks staff as alternatives to COs that do take into account local values and political context. A different set of priorities has been emerging from the implementation of these alternative guidelines in some Amazonian National Parks.

5.2. Informed Decision-Making?

This study contributes to making visible another idealization shared by both conventional and inclusive PA management ideals: “informed decision-making” is understood from both perspectives as a process that is (a) critically based on ecological knowledge (either produced by experts or through collaborative research); and (b) oriented by clearly stated objectives (either imposed by the State or jointly identified) and implemented through organized strategies (either led by the State or collaborative arrangements).

While conventional management ideals depended heavily on expert knowledge for the generation of this information [61], in the face of complexity, it is argued that ecological information and knowledge, still fundamental, is distributed among different stakeholders at different scales [3]. Here, however, management did not seem to be an information-intensive endeavor; most of the knowledge that was mobilized by local decision-makers could better be defined as social learning, as characterized by Pahl-Wostl, *et al.* [62]. Learning was related to the functioning of the institutional network around the ANP, especially on the relationships between levels and scales and the ways to mobilize them. This case-study suggests, along with Pahl-Wostl *et al.*, that “The problem that we face when we deal with sustainability lies not so much in our lack of understanding of the functioning of ecological systems, but in our lack of understanding of the governance and cultural systems and how they are structured and managed and interact with ecological systems.” [62].

Regarding the idea of how natural resources management takes place, there has been a change from top-down, command and control visions towards collaborative, adaptive arrangements. These are proposed as ways to deal with social illegitimacy of centralized management and with the multi-level and uncertain nature of social-ecological systems. Usually, implicitly or explicitly, this kind of arrangement is expected to go through stages that include the sharing of power by the state, the (joint)

definition of objectives, the (collective) production of knowledge and the (cooperative) implementation of strategies, e.g., [16].

In this study, management actions apparently did not respond to a process of open and orderly deliberation around collectively built knowledge. Rather, they responded to the need to build, maintain or mobilize multi-scale social networks as a response to long-term social-ecological dynamics or crises. As said before, the vision proposed by Delgado and Strand [42] of environmental governance as a complex dance, in which actors adjust their movements to the rhythmic or unexpected movements of other actors, to the social space and to unexpected events, and in which serendipity and spontaneity play an important role, is similar to the situation described in this article.

If PA management is enacted through mobilizing complex social-ecological networks, in a scenario where social and political circumstances play a central role, it should not be surprising that what matters at the end of the day about co-production of knowledge is its ability to increase governance and to deal with political tensions, rather than as a device for generating “better knowledge”.

6. Conclusions

In accordance with international academic and regulatory trends, Colombian protected area management guidelines have adopted inclusive principles. Particularly, there has been a call for the collective production of knowledge for informing decision-making. It has been argued that co-produced knowledge is better suited to understand and deal with multi-scale, unpredictable social-ecological systems. In Amacayacu National Park (ANP), in the Southern Colombian Amazon, co-production of knowledge for informing management has been promoted for over 15 years in various scenarios, involving Indigenous peoples, academic researchers and park staff.

These inclusive processes have had important consequences for ANP governance. However, these consequences do not result from the functioning of the idealized knowledge-action circuit, in which knowledge products are expected to inform rational decision-making. Such a circuit is not operating in ANP. The absence of such a circuit can be explained in terms of the political load of knowledge production (both collective and scientific knowledge), and in terms of the actual management of ANP, which is better understood as the continuous building, strengthening and mobilizing of social networks by park staff to enroll the other actors in the park.

The impact of co-production of knowledge on ANP governance can be explained by a closer look at the functioning of the Park. Management in ANP consisted mainly in a combination of actions at different temporal and spatial scales aimed at the generation, maintenance or re-orientation of multi-level social-ecological networks. In this context, processes for the co-production of knowledge was of key importance for governance, in as far as they contributed to creating and strengthening long-term relationships between stakeholders, to trust building, to power re-distribution and to social learning.

Acknowledgments

We wish to thank Tropenbos and the Unit of National Parks of Colombia for supporting and encouraging the field work of this research. Also, critical comments by members of staff of both institutions were key for developing the arguments presented here. The first author received financial support from the WWF Russell E. Train Education for Nature Program and from the Centre for the

Study of the Sciences and the Humanities at the University of Bergen (Norway). The Alexander von Humboldt Institute supported the writing of this manuscript.

Conflict of Interest

While performing part of the research presented in this paper, Paula Ungar worked as assistant to the general director in Tropenbos and as a supporting professional of the Technical Sub-direction of National Parks. Roger Strand reports of no conflicts of interests.

References and Notes

1. Borrini-Feyerabend, G.; Jaireth, H. *Sharing Power: Learning by Doing in Co-Management of Natural Resources throughout the World*; IIED and IUCN/CEESP/CMWG: Tehran, Iran, 2004.
2. Wallington, T.J.; Hobbs, R.; Moore, S.A. Implications of Current Ecological Thinking for Biodiversity Conservation: A Review of Salient Issues. *Ecol. Soc.* **2005**, *10*, 15.
3. Berkes, F. Evolution of co-management: Role of knowledge generation, bridging organizations and social learning. *J. Environ. Manage.* **2009**, *90*, 1692–1702.
4. Dudley, N. *Guidelines for Applying Protected Areas Management Categories*; IUCN: Gland, Switzerland, 2008; pp. 1–86.
5. Holling, C.S. Two Cultures of Ecology. *Conserv. Ecol.* **1998**, *2*, 4.
6. Van Kerkhoff, L.; Lebel, L. Linking Knowledge and Action for Sustainable Development. *Annu. Rev. Environ. Resour.* **2006**, *31*, 445–477.
7. Roux, D.J.; Rogers, K.H.; Biggs, H.C.; Ashton, P.J.; Sergeant, A. Bridging the science-management divide: moving from unidirectional knowledge transfer to knowledge interfacing and sharing. *Ecol. Soc.* **2006**, *11*, 4.
8. Strand, R. Complexity, Ideology and Governance. *Emergence* **2002**, *4*, 164–183.
9. Funtowicz, S.; Strand, R. Models of Science and Policy. In *Biosafety First: Holistic Approach to Risk and Uncertainty in Genetic Engineering and Genetically Modified Organisms*; Traavik, T., Lim, L.C., Eds.; Tapir Academic Press: Trondheim, Norway, 2007; pp. 263–278.
10. Holling, C.S.; Meffe, G.K. Command and control and the pathology of natural resource management. *Conserv. Biol.* **1996**, *10*, 328–337.
11. Botkin, D. *Discordant Harmonies: A New Ecology for the Twenty-First Century*. Oxford University Press: New York, NY, USA, 2000.
12. Nazarea, V. Local Knowledge and Memory in Biodiversity Conservation. *Annu. Rev. Anthropol.* **2006**, *35*, 317–335.
13. Ludwig, D. The era of management is over. *Ecosystems* **2001**, *4*, 758–764.
14. Berkes, F. Rethinking Community-Based Conservation. *Conserv. Biol.* **2004**, *18*, 621–630.
15. Cundill, G.N.R.; Fabricius, C.; Marti, N. Foghorns to the future: Using knowledge and transdisciplinarity to navigate complex systems. *Ecol. Soc.* **2005**, *10*, 8.
16. Stringer, L.; Dougill, A.; Fraser, E.; Hubacek, K.; Prell, C.; Reed, M. Unpacking “Participation” in the Adaptive Management of Social-ecological Systems: A Critical Review. *Ecol. Soc.* **2006**, *11*, 39.

17. Davidson-Hunt, I.J.; O'Flaherty, R.M. Researchers, indigenous peoples, and place-based learning communities. *Soc. Nat. Resour.* **2007**, *20*, 291–305.
18. Huntington, H.P. Using traditional ecological knowledge in science: Methods and applications. *Ecol. Appl.* **2000**, *10*, 1270–1274.
19. Hill, S.; Coombes, B. The limits to participation in dis-equilibrium ecology: Maori involvement in habitat restoration within Te Urewera National Park. *Sci. Cult.* **2004**, *13*, 37–74.
20. Cash, D.W.; Adger, W.N.; Berkes, F.; Garden, P.; Lebel, L.; Olsson, P.; Pritchard, L.; Young, O. Scale and cross-scale dynamics: governance and information in a multilevel world. *Ecol. Soc.* **2006**, *11*, 8.
21. Robbins, P. Paper Forests: Imagining and deploying exogenous ecologies in arid India. *Geoforum* **1998**, *29*, 69–86.
22. Adger, W.N.; Brown, K.; Tompkins, E.L. The political economy of cross-scale networks in resource co-management. *Ecol. Soc.* **2005**, *10*, 9.
23. Sletto, B. The Knowledge that Counts: Institutional Identities, Policy Science, and the Conflict Over Fire Management in the Gran Sabana, Venezuela. *World Dev.* **2008**, *36*, 1938–1955.
24. Robertson, D.; Hull, R.B. Public ecology: An environmental science and policy for global society. *Environ. Sci. Policy* **2003**, *6*, 399–410.
25. Shackelford, J.M.; Campbell, L.M. Traditional ecological knowledge in conservation research: Problems and prospects for their constructive engagement. *Conserv. Soc.* **2007**, *5*, 343.
26. Turnhout, E.; Hisschemoller, M.; Eijssackers, H. Ecological indicators: Between the two fires of science and policy. *Ecol. Indic.* **2007**, *7*, 215–228.
27. Kay, J.J.; Regier, H.A.; Boyle, M.; Francis, G. An ecosystem approach for sustainability: Addressing the challenge of complexity. *Futures* **1999**, *31*, 721–742.
28. Giller, K.E.; Leeuwis, C.; Andersson, J.A.; Andriess, W. Competing Claims on Natural Resources: What Role for Science? *Ecol. Soc.* **2008**, *13*, 34.
29. Armitage, D.R. *Adaptive Co-Management: Collaboration, Learning, and Multi-Level Governance*; University of British Columbia Press: Vancouver, Canada, 2007; p.334.
30. Reed, M.; Evely, A.C.; Cundill, G.; Fazey, I.R.A.; Glass, J.; Laing, A.; Newig, J.; Parrish, B.; Prell, C.; Raymond, C. What is social learning? *Ecol. Soc.* **2010**, *15*, 1.
31. Folke, C.; Hahn, T.; Olsson, P.; Norberg, J. Adaptive governance of social-ecological systems. *Annu. Rev. Environ. Resour.* **2005**, *30*, 441–473.
32. Plummer, R.; Fitz Gibbon, J. Connecting Adaptive Co-Management, Social Learning, and Social Capital through Theory and Practice. In *Adaptive Co-Management: Collaboration, Learning and Multilevel Governance*; Armitage, D., Berkes, F., Doubelday, N., Eds.; UBC Press: Vancouver, Canada, 2007; pp. 38–61.
33. Armitage, D.; Marschke, M.; Plummer, R. Adaptive co-management and the paradox of learning. *Glob. Environ. Change* **2008**, *18*, 86–98.
34. UAESPNN. *Política de Participación Social en la Conservación*; Unidad Administrativa Especial de Parques Nacionales Naturales de Colombia: Bogotá, Colombia, 2001; Volumen 1, p. 166.
35. Ruiz, S.L.; Sánchez, S.E.; Tabares, E.; Prieto, A.; Arias, J.C.; Gómez, R. *Diversidad biológica y cultural del sur de la Amazonia colombiana—Diagnóstico*. Corpoamazonia, Instituto Humboldt, Instituto Sinchi, UAESPNN: Bogotá, Colombia, 2007; p. 636.

36. Gentry, A. La Región Amazónica. In *Selva Húmeda de Colombia*; Schultes, A., Gentry, A., Castaño, C., Alberico, M., Eds.; Villegas Editores: Bogotá, Colombia, 1990.
37. UAESPNN; WWF. Informe Nacional de Resultados de la Metodología "Análisis de Efectividad del Manejo de Áreas Protegidas con Participación Social" Ciclos de aplicación 2004–2006. 2007.
38. Strauss, A.; Corbin, J. Grounded Theory Methodology: An Overview. In *Handbook of Qualitative Research*; Denzin, N.L.Y., Ed.; Sage Publications, Inc.: Thousand Oaks, CA, USA, 1994; pp. 273–285.
39. Crona, B.; Hubacek, K. The Right Connections: How do Social Networks Lubricate the Machinery of Natural Resource Governance? *Ecol. Soc.* **2010**, *15*, 18.
40. UAESPNN. *Ordenamiento Ambiental y Conservación: la Experiencia de las Áreas Protegidas Trasladas con Territorios Indígenas en la Amazonia colombiana*. Parques Nacionales Naturales de Colombia: Bogotá, Colombia, 2011; pp. 1–272.
41. Delgado, A.; Strand, R. Looking North and South: Ideals and realities of inclusive environmental governance. *Geoforum* **2010**, *41*, 144–153.
42. Plummer, R. The adaptive co-management process: An initial synthesis of representative models and influential variables. *Ecol. Soc.* **2009**, *14*, 24.
43. Kay, J.J. Ecosystems as self-organizing holarchic open systems: Narratives and the second law of thermodynamics. In *Handbook of Ecosystem Theories and Management*; Jorgensen, E.M.F., Ed.; CRC Press-Lewis Publishers: Boca Raton, FL, USA, 2000; pp. 135–160.
44. Wollenberg, E. *Anticipating Change: Scenarios as a tool for adaptive forest management: A guide*. CIFOR: Bogor, Indonesia, 2000.
45. PNUD. *Informe Regional sobre Desarrollo Humano para América Latina y el Caribe*; PNUD: San José, Costa Rica, 2010.
46. OCCT. *Indicadores de Ciencia y Tecnología, Colombia 2008*; Observatorio Colombiano de Ciencia y Tecnología: Bogotá, Colombia; 2009; pp. 1–142.
47. CDH. *Derecho a la Educación de Poblaciones Indígenas y Afrodescendientes en la Americas. Informe Preparado para la Comisión Interamericana de Derechos Humanos*; Bogotá, Colombia, 2009.
48. Sherry, E.; Myers, H. Traditional environmental knowledge in practice. *Soc. Nat. Resour.* **2002**, *15*, 345–358.
49. Rodríguez, C. Proyectos-Plata o Proyectos-Pensamiento. In *Alternativas Productivas en la Amazonia Colombiana. Enfoques y Procesos Desde lo Local*; Rivera Pérez, M.V., Ed.; Programa COAMA: Bogotá, Country, 2003; pp. 27–55.
50. Posey, D.A.; Dutfield, G.; Plenderleith, K. Collaborative research and intellectual property rights. *Biodivers. Conserv.* **1995**, *4*, 892–902.
51. Wynne, B. Misunderstood misunderstanding: Social identities and public uptake of science. *Public Underst. Sci.* **1992**, *1*, 281–304.
52. Stocks, G.; Seales, L.; Paniagua, F.; Maehr, E.; Bruna, E. Title of the article. *Biotropica* **2008**, *40*, 397–404.
53. Moerman, D.E.; Eastbrook, G.F. The botanist effect: Counties with maximal species richness tend to be home to universities and botanists. *J. Biogeogr.* **2006**, *33*, 1969–1974.

54. Sastre, P.; Lobo, M. Taxonomist survey biases and the unveiling of biodiversity patterns. *Biol. Conserv.* **2009**, *142*, 462–467.
55. Latour, B.; Woolgar, S. *Laboratory Life: The Construction of Scientific Facts*; Princeton University Press: Princeton, NJ, USA, 1979.
56. Escobar, A. Whose Knowledge, Whose Nature? Biodiversity, Conservation and the Political Ecology of Social Movements. *J. Polit. Ecol.* **1998**, *5*, 53–82.
57. Scoones, I. New ecology and the social sciences: What prospects for a fruitful engagement? *Annu. Rev. Anthropol.* **1999**, *28*, 479–507.
58. Verran, H. A postcolonial moment in science studies. *Soc. Stud. Sci.* **2002**, *32*, 729.
59. Nadasdy, P. Reevaluating the Co-management Success Story. *ARCTIC* **2003**, *56*, 367–380.
60. Stevenson, M.G. The possibility of difference: Rethinking co-management. *Hum. Organ.* **2006**, *65*, 167–180.
61. Bryant, R. Power, Knowledge and Political Ecology in the Third World: A Review. *Prog. Phys. Geog.* **1998**, *22*, 79–94.
62. Pahl-Wostl, C.; Mostert, E.; Tàbara, D. The growing importance of social learning in water resources management and sustainability science. *Ecol. Soc.* **2008**, *13*, 24.

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