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Exploring the gap between conservation science and protected area establishment in the Allpahuayo-Mishana National Reserve (Peruvian Amazonia)

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SUMMARY

Global assessments demonstrate that as a conservation measure protected areas (PAs) are incomplete, and tend to be poorly documented in the international scientific literature, hindering the assessment of their scientific and policy foundations. The step from mapping priority areas for biodiversity conservation based on scientific information to formulating the practical tools for conserving biological diversity is critical; several key aspects such as legislative frameworks, multi-scale politics and socioeconomic realities must be taken into account. With the planet's human population continuing to grow, this step is all the more crucial, as the designation of PAs is increasingly being forced alongside the development frontier. This paper examines the process of reserve establishment in the case of the Allpahuayo-Mishana National Reserve (AMNR) (Peruvian Amazonia). On the basis of interviews, document analysis and media studies, a series of actions and reactions worked to shape the ultimate categorization and management plan of the AMNR. While scientific knowledge played a central role in the initial selection of the AMNR site, a number of critical aspects such as estimated environmental services, unresolved land entitlements, use values and multi-scale politics needed to be addressed in order to meet the originally set objective of biodiversity conservation. The importance of several biophysical features of the AMNR was initially emphasized as a key argument for conservation, whereas potential benefits of the AMNR (such as environmental services, particularly at the regional scale) proved to be the ultimate driving factor. Between the AMNR's official establishment in 1999 and its approved categorization and management plan in 2004 and 2005, respectively, a substantial shift in argumentation was witnessed. This change was particularly influential in that, contrary to what was initially expected, the livelihood requirements of local communities that were strongly linked to land entitlements and natural resources management came to play an essential role in both the categorization process and in the elaboration of the management plan of the Reserve. The AMNR was only effectively established because of this shift in emphasis.

Keywords: Amazonia, Peru, protected area establishment, stakeholder perceptions, sustainable use, tropical forest conservation

INTRODUCTION

The global protected areas (PAs) network has recently been described as inadequate if ambitious goals to save the world's biodiversity are to be reached (Rodrigues *et al*. 2004; Chape *et al*. 2005). While many scientific priority-setting approaches have been suggested (Myers *et al*. 2000; Eken *et al*. 2004), the step from mapping priority areas for conservation based on scientific information, to formulating the practical tools for conserving biological diversity, is less well documented. In order to make both ends meet, several key aspects, such as legislative frameworks, multi-scale politics and socioeconomic factors have to be taken into account.

While many case studies dealing with PA establishment have been published (for example Carruthers 1995; Sellars 1997), detailed analysis of the historical, scientific, technical, political and administrative processes leading to PA establishment is scarce. With advances in conservation science and new priority sites being proposed for PA establishment, assessing the scientific and policy foundations of PA networks is important but difficult to undertake unless there is a systematic documentation of PA establishment processes across different contexts.

Western Amazonia is an environmental mosaic (Tuomisto *et al.* 1995), having developed over millions of years under the influence of multiple interactions between lowland river systems and the tectonically active Andean mountains (Salo *et al.* 1986; Räsänen *et al.* 1987; 1990). In this biogeographical context, Peruvian Amazonia hosts a high diversity of species and ecosystems of which particularly those found in lowland rainforests have managed to avoid falling victim to large-scale deforestation, primarily because of the lack of road building in the area, albeit with noteworthy exceptions (Imbernon 1999; Mäki *et al.* 2001; Alvarez & Naughton-Treves 2003).

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Table 1 Timeline of main events leading to the establishment of what is today the AMNR.

Period	*Event*
1970s	Biological research station 'Allpahuayo' set up, mainly to serve the National University of Peruvian Amazonia students
1982	34 513 ha around Mishana are declared a Reserve in Study by Directorial Resolution 217 of the Agrarian Region XXII of Loreto
1994	Researchers in IIAP propose to turn the land owned by the Allpahuayo Research Station into a 'Productive Reserve', to manage forest resources and wild fauna. The proposal is rejected
1995	National Priority areas for conservation identified (Rodríguez 1996)
1996	First draft of the Ecological-Economic Zoning outlined by the IIAP
1997	IIAP presents the first proposal for the creation of a PA including management options for the various eco-zones within the reserve
1998	Study of the geo-ecological features of the site and their implications for future land use and development (Kalliola & Flores Paitán 1998)
1999	
January	Proposal for a PA presented to the then President of Peru and to the Head of INRENA
March	Proposal and recognition of the Reserve signed by the President of Peru
April	Some settlements in the AMNR voluntarily translocate to other sites, with the aim of minimizing natural resource use within the Reserve
October	First consultation workshop held with stakeholders, including local communities
December	Second consultation workshop held with stakeholders, including local communities
2000	Management plan initiated
2001	Buffer zone provisionally established; land invasions rejected
2002	Land invasions rejected; Ministry of Agriculture recognizes the communities along Nanay River officially as peasant communities
2003	The technical committee's proposal for the categorization and delimitation of the reserve processed in INRENA; administrative committee for the AMNR created
2004	The AMNR categorized as a National Reserve
2005	Management plan approved containing zonation of the AMNR; entitling process continues

In this paper we provide the case history of a Peruvian PA where the rapid deterioration of biological diversity linked to road building was recently halted (Mäki *et al.* 2001). The main objective of the Allpahuayo-Mishana National Reserve (hereafter AMNR or 'Reserve') was to protect what is left of the so-called 'white sand forests' (Anderson 1981; Whitney & Álvarez 1998), while providing subsistence and future development assets for rural communities inhabiting the area, as well as securing ecosystem services, particularly in terms of drinking water to the nearby city of Iquitos.

We aim to explain how and why the AMNR came to be designated a priority site for conservation, and analyse what factors led to, and ultimately determined, its subsequent PA categorization and management plan. We analyse three sources of data collected between 2000 and 2005: scientific and technical documents, written media in Iquitos and interviews carried out in both Iquitos and Allpahuayo-Mishana. We present a chronology of events and processes (Table 1) and highlight the critical preconditions, turns, actors and arguments that led to what can be considered a relatively rapid creation of a PA in a context that is not entirely conflict-free.

Our study of the process and consequences of the establishment of the AMNR was initiated in 1999, soon after its establishment as a Reserved Zone (a provisional status given to a PA while its final category is being determined). Our main interests lay in the interface between the scientific base of the Reserve's creation and the public debate that the establishment generated particularly in the city of Iquitos (Salo 2001), and in the role of institutions, participation and markets in determining the area's feasibility for productive conservation (Pyhälä 2003).

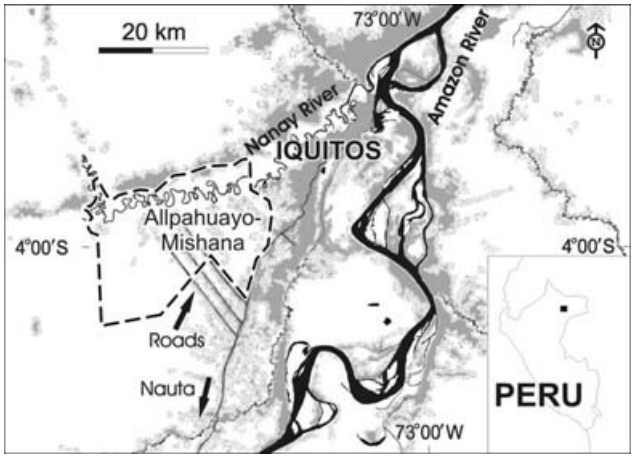

Figure 1 Map of the study site. Dashed line indicates the boundaries of the AMNR. The area shaded in grey indicates the current deforestation frontiers associated with road and river access.

The AMNR (58 069.9 ha) is situated approximately 25 km south-west of the city of Iquitos in North-eastern Peru (Fig. 1). The Reserve is at 110–180 m above sea level between the Nanay River and the road from Iquitos to Nauta. The

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vegetation is tropical lowland seasonally inundated floodplain rainforest and non-inundated *tierra firme* forest.

The Reserve is home to six *ribereño* communities who, although largely descendants of migrants to the area, have adapted to the region and adopted methods comparable to those of the indigenous peoples of Amazonia. The communities within the Reserve are located along the banks and flood plains of Nanay River, with additional communities and settlements bordering the Reserve in its buffer zone.

Although official recognition of the AMNR as a PA is recent, the area has attracted the attention of local and international scientists and conservationists since the 1970s and the area's rich flora and fauna are relatively well known by Amazonian standards.

The area's biological diversity is high, largely owing to the complex and heterogeneous mosaic of habitats characteristic of the Iquitos region (Linna *et al.* 1998; Whitney & Álvarez 1998; Ruokolainen & Tuomisto 1998), which is, in turn, because of the region's geological history (Kalliola & Flores Paitán 1998). Characteristic features of the AMNR area are its white sand forest patchwork growing on heavily-weathered nutrient-poor quartz soils (Linna *et al.* 1998) and inundation of the floodplain forest by the Nanay River. A significant part of the AMNR forests grow on nutrient-rich clay-rich soils originating from the lacustrine/estuarine Pebas megalake in the Miocene (Wesselingh *et al.* 2002; Roddaz *et al.* 2005).

The Peruvian tropical Andes belong to one of the world's biodiversity 'hotspots' (Myers 1988), with key biodiversity areas still being identified in the region (Eken *et al.* 2004). The AMNR, however, is a lowland rainforest site, thus excluding it from such identified priority areas.

Although the first Peruvian PAs were selected in the 1960s to protect certain species, the focus shifted in the 1970s to predicting species distributions: first on a coarse scale (coast, mountains, rainforest), and later, with the objective of including the entire country's ecosystem types in the national PA system, identifying them using the 'life zone' approach (Holdridge 1947), and ecological (Tosi 1960) and biogeographical mapping (Udvardy 1975).

Furthermore, endemism and species richness centres have been used as biodiversity surrogates and some PAs have been established in order to cover gaps in the representation of certain biogeographical regions. Peruvian conservation priorities were identified in the mid-1990s (Rodríguez 1996), mostly through expert workshops.

The establishment of a PA in the Peruvian national PA system (SINANPE) requires an official proposal (commonly based on work done by national and international non-governmental organizations [NGOs] and research institutions) including studies on the biological values, threats and socioeconomic feasibility of conservation, to the authorities in the National Institute for Natural Resources (INRENA). If the proposition is approved, a Reserved Zone is established, until the final category of the reserve has been determined based on more detailed studies. There are nine PA categories ranging from strict protection to integrating conservation and development.

A high percentage of Peruvian Amazonia constitutes timber production forests, forestry concessions, communal territories and PAs. Nevertheless, the Peruvian PA network has recently been expanded, with many of the new sites offering large relatively remote and often sparsely populated spaces (such as the Alto Purús National Park), where creation of PAs is politically easier than in more densely populated areas.

In this context, the AMNR stands out as an exception, and as an example demonstrating the necessary preconditions and steps for a PA to be established directly on the development frontier. Creating PAs in such settings is becoming increasingly common worldwide, as ever more land is being placed under intensive human use. In fact, PAs in densely populated areas are the prime showcases of conservation in human-dominated landscapes.

MATERIALS AND METHODS

We analyse two different datasets: the first based on 12 months of field-based research initiated in 2000 (A. Pyhälä) and two months initiated in 2001 (M. Salo); the second drawing on nine subsequent visits made to the area by both authors between 2002 and 2005 (M. Salo made six visits, total seven months; A. Pyhälä made three visits, total three months), during which we collected information supplementing our dataset.

The data collected in order to analyse stakeholder perceptions of the creation of the AMNR (Salo 2001) consist of taped semi-structured interviews ($n = 29$), for which selection criteria included having informants representing a wide array of different stakeholders, both those directly affected by the Reserve and those with more distant interests (i.e. local opinion leaders, such as politicians and journalists). These stakeholder groups were identified based on interviews of key informants and a thorough document and newspaper review. Representatives of each stakeholder group were selected based on their visibility in these interviews and in the media. Of the 29 interviewees, 16 were directors of their respective institutions (or of relevant sections therein), and six had been directly involved in the establishment of the AMNR. The informants were asked a fixed set of open-ended questions exploring their perceptions of the reasons behind the AMNR's creation, characteristics, establishment process, implications for different stakeholders and information dissemination.

Qualitative data collected to analyse the AMNR's potential for productive conservation (Pyhälä 2003) came from 126 interviews and 21 meetings, as well as a number of additional sources. Of the interviews, 97 were with residents of the AMNR (including six community leaders); seven with key informants or authorities of communities bordering the Reserve; 19 were with representatives (14 of whom were directors) of conservation or development (or otherwise relevant) organizations in Iquitos; and four were with key informants or representatives (including three directors) of relevant conservation institutions in Lima. Of the

126 interviewees, 114 had been directly involved in the establishment of the AMNR.

Although we attempted to sample every household in all six communities in the AMNR, not all households were present during visits to the communities; we sampled 94% of households and interviewed 88%. The open-ended interviews were carried out with the aid of a list of questions based on a predefined research framework aimed at understanding the socioeconomic and institutional aspects of biodiversity conservation and PA establishment specific to the AMNR, with particular interest in local livelihoods, priorities and views.

In addition to the semi-structured, household surveys and interviews, much of the research was carried out using informal and unstructured interviewing (Bernard 1995) to obtain a wider and deeper understanding of backgrounds, contexts and processes. Interviews carried out with key decision-makers in the capital city Lima provided valuable information and expanded the understanding of the broader institutional structure and political aspects of conservation and development at the national level.

In addition to the interviews, further data were obtained through archival research and a survey of three local written media. The weekly journal *Kanatari* and the daily papers *La Región* and *El Matutino* were surveyed (time frame 1999–2000) and all articles mentioning the AMNR were collected for further analysis ($n = 48$).

We present our analysis in roughly chronological order, with the scientific and technical documents serving as a 'baseline of events' assisting to reconstruct the administrative steps through which the Reserve became established.

Study area details

Most of the Reserve is situated on public land that is partly titled to state institutions. However, during the study period, five communities within the Reserve entered a process of communal land entitlement (one community already possessed a legal land title). The AMNR has a human population approaching 1000 within its perimeter, which, together with the large population of nearby Iquitos (*c.* 500 000) has a high demand for forest and agricultural products (Pyhälä 2003). The growing demand for land and resources, accompanied by road construction, has resulted in increased pace of deforestation (Mäki *et al.* 2001).

The communities of the AMNR rely on a variety of activities for subsistence, of which slash-and-burn agriculture is the most important, manioc being the staple crop. Fish and bushmeat provide the primary source of protein, and non-timber forest products, particularly fibres, palm thatch and seasonal fruits, also play a significant part in household subsistence. Timber extraction and agriculture are the most important economic activities, accounting for an average of 47% and 32% of total household incomes, respectively (Pyhälä 2003). Non-timber forest products (NTFPs) account for only 10%, hunting for 8% and fishing for 3% of the average household income (Pyhälä 2003).

RESULTS

Reserve establishment: a chronology of events

Growing scientific knowledge on biodiversity

The first scientific studies in the AMNR area focused on primates (Kinzey 1974; Ramírez *et al.* 1977), bats (Davis & Dixon 1976) and reptiles (Dixon & Soini 1975, 1977), the last involving the discovery of 142 species in the lower Nanay River basin. These and other findings were only the beginning of a number of subsequent scientific discoveries, including endemic, newly discovered and endangered species (Whitney & Álvarez 1998; Álvarez & Whitney 2001; Isler *et al.* 2001; Plan Maestro 2005; Whitney & Alonso 2005).

Following the rapid rise in scientific knowledge on the AMNR, there was a resolution in 1982 to establish a 'reserve in study' (Vargas La Rosa 1985). The proposed reserve was never legally enforced and, soon after, much of the area was parcelled out to private landholders and state institutions. Yet scientists continued to visit the site. Description of a site near the village of Mishana having 275 tree species on a one-hectare plot (Gentry 1988) drew much international scientific attention to the area. Peters *et al.* (1989) inventoried a one-hectare plot next to Mishana and valued its NTFPs more highly than its timber resources, findings that were criticized (see Sheil & Wunder 2002; Pyhälä 2003).

Uniqueness and threats to the mosaic forests

The soils of the AMNR vary greatly in their age, structure and nutrient content, and the area's white sand forests support a number of specialist flora and fauna (Whitney & Álvarez 1998; Fine *et al.* 2005). The mosaic of different soil types (with greatly varying potential for different land-use forms) has not been taken sufficiently into account in land-use planning (Mäki *et al.* 2001).

Iquitos is isolated by lowland rainforests with the exception of rivers and a 100-km road leading to the town of Nauta. The rate of deforestation peaked in the late 1980s when penetrating branches of the road were constructed using zero-interest loans offered by the Agrarian Bank (Mäki *et al.* 2001), although the rate was significantly lower in the mostly state-owned lands north-west of the road. The latter half of the 1990s saw a growing demand for recreational resorts and short-term swidden agriculture and extraction, leading to an expected rise in the value of land near the expanding city of Iquitos and along the route to Nauta.

Birth of the Reserve and the aftermath

Alarmed by the rapid rate of deforestation, and encouraged by the still relatively intact state of the forests adjacent to the Iquitos-Nauta road, biologists from the Iquitos-based Research Institute of Peruvian Amazonia (IIAP) started in the mid-1990s to campaign in favour of the establishment of a PA in the AMNR. In 1996, the area was defined as belonging to one of Peru's 38 priority areas for conservation (Rodríguez 1996), and the following year IIAP presented a proposal for a PA. Two years later, a group of international scientists with diplomatic help established a direct channel to the Peruvian government.

Table 2 Potential benefits of the AMNR, mentioned in 48 articles covering the Reserve in three Iquitos-based written media in 1999–2000, and the number of benefits mentioned in a given article.

Benefit	*Number of articles that mention a named benefit*		*Number of benefits mentioned in a given article*		
	Articles (n)	*% of total (n = 48)*	*Benefits mentioned (n)*	*Articles (n)*	*% of total (n = 48)*
Tourism development	16	33%	0	26	54%
Education	13	27%	1–3	8	17%
Leisure activities	11	23%	4–6	3	6%
Benefits for future generations	11	23%	7–9	6	13%
Assets for medical industry	10	21%	>10	5	10%

Top-level political decision-makers were assured that, in addition to the AMNR being a biologically-rich site, the most explicit reasons for its designation as a PA lay in the potential economic benefits (for example from ecotourism) that it could provide to the entire Iquitos region. With the final push given by international lobbying, and building on its previous proposal, IIAP presented a new proposal for the creation of a PA in January 1999, which led to the decree of Allpahuayo-Mishana as a Reserved Zone in March 1999 (El Peruano 1999).

Rainforest products had for decades provided a livelihood for the communities living inside the area. More recent colonists along the road and city-dwellers had also been using its natural resources. All but one of the communities within the boundaries of the Reserve lacked legal land titles, and, in April 1999, some of the most recent settlements within the Reserve boundaries were voluntarily relocated elsewhere.

Categorization and management

A technical commission to draft the PA's categorization and delimitation was drawn together from representatives of INRENA, the government of the Department of Loreto (CTAR-L) and IIAP. The commission organized two 'consultation workshops' with the aim of determining the PA category of Allpahuayo-Mishana in a participatory manner (for a critique of how 'participatory' the process was, see Pyhälä 2003).

Both workshops were held in Iquitos where multiple stakeholders, including representatives of the local communities, were invited. The workshops resulted in the area being proposed as a 'National Reserve' (a Peruvian PA category aimed at conservation and sustainable use of biodiversity) because the area was nationally important for conservation, but also had important direct use values and local communities. Following the establishment of a provisional buffer zone around the AMNR, a number of organized land invasions took place in the Reserve in 2001 and 2002; however the invaders were soon expelled by the police with the support of local communities.

The Reserve was designated a 'National Reserve' in 2004 (El Peruano 2004), and the official management plan required by the PA legislation was subsequently approved by INRENA in 2005 and included a zoning plan designating areas ranging from strict protection to direct use (Plan Maestro 2005).

Stakeholders' perceptions and the media

Interview and media data were used to highlight critical issues in the process of turning Allpahuayo-Mishana from a scientifically-justified conservation priority into a PA. This was in terms of different stakeholders' perceptions of reasons behind Reserve establishment and their understandings of the implications, functions and future prospects of the reserve.

Until the late 1990s, proposals for a Reserve had remained mainly within scientific circles; other actors were surprised by the establishment of a PA. Following the creation of the Reserve, the issue was highlighted by the Iquitos media, and the public debate fluctuated mainly between two points of view: (1) Reserve planners defending the AMNR for its biological uniqueness, environmental services it provides and economic value of its biodiversity, and (2) opponents of the Reserve, who maintained that the Reserve was illegally established, forcefully expelling local communities and counterproductive vis-à-vis local and regional development goals.

In 1999, detailed articles in the local press reflected the Reserve's planners' views of its scientific base, its justification in environmental terms and the potential benefits it could provide (Table 2). Thereafter, interest in the Reserve in the written media declined; on average, the number of biological reasons for its creation, potential benefits and the ecological threats to the area mentioned per article decreased over time (Fig. 2).

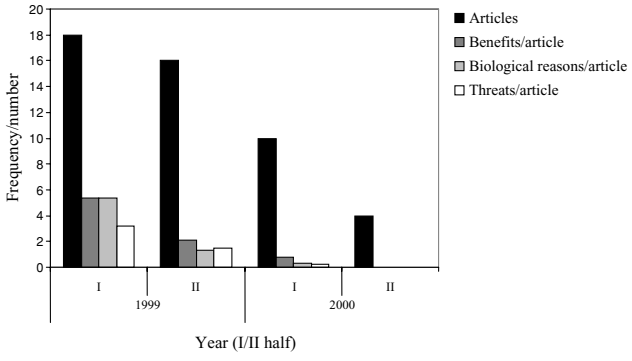

Figure 2 The number of articles half-yearly in the Iquitos-based press dealing with the AMNR in 1999 and 2000 (I = January–June, II = July–December). The average number of mentions per article of possible benefits of the Reserve, biological reasons for its creation and ecological threats behind its establishment.

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Table 3 Scientific reasons for the creation of the AMNR, mentioned in 48 articles covering the Reserve in three Iquitos-based written media in 1999–2000, and the number of named reasons mentioned in a given article.

Reason	*Number of articles that mention a named reason*		*Number of reasons mentioned in a given article*		
	Articles (n)	*% of total (n = 48)*	*Reasons mentioned (n)*	*Articles (n)*	*% of total (n = 48)*
White sand forests	17	35%	0	30	63%
Endemism	15	31%	1–3	10	21%
Tree species record	10	21%	4–6	3	6%
Reptile species record	9	19%	7–9	4	8%
Uniqueness	8	17%	10	1	2%

Table 4 Environmental features in the AMNR, mentioned by the 29 interviewees in Salo (2001), and the number of named features mentioned by a given interviewee.

Feature	*Number of interviewees that mention a named feature*		*Number of features mentioned by a given interviewee*		
	Interviewees (n)	*% of total (n =29)*	*Features mentioned (n)*	*Interviewees (n)*	*% of total (= 29)*
White sand forests	12	41%	0	2	7%
Animal diversity	9	31%	1–2	8	28%
Endemism	7	24%	3–4	9	31%
Soil mosaic/rare soils	7	24%	5–6	8	28%
Unique ecosystems	7	24%	7	2	7%

Table 5 Ecological threats behind the creation of the AMNR, mentioned in 48 articles covering the Reserve in three Iquitos-based written media sources in 1999–2000.

Threat	*Number of articles mentioning a named threat*		*Number of threats mentioned in a given article*		
	Articles (n)	*% of total (n = 48)*	*Reasons mentioned (n)*	*Articles (n)*	*% of total (n = 48)*
Hydrological problems	11	23%	0	30	63%
Deforestation	11	23%	1–3	7	15%
Destruction by forestry	10	21%	4–6	5	10%
Destruction by agriculture	9	19%	7–9	4	8%
Soils unsuitable for agriculture	9	19%	10	2	4%

The perceived reasoning behind the AMNR

Biological features of the area most commonly mentioned in the press were the white sand forests, endemic taxa, high species richness and general uniqueness. The interviewees considered such biological features as the basis of the AMNR's establishment (Tables 3 and 4).

The area's biological uniqueness was not the only publicly available justification for the establishment of the AMNR. The threats to the environmental services provided by the area's forests were also addressed in the press, the single most important and most commonly mentioned being the role that the AMNR would play in safe-guarding Iquitos' drinking water supply, which was said to be threatened by mercury pollution from illegal gold mining activities in the Nanay River Basin. Additional ecological threats mentioned were the Iquitos-Nauta road and the expansion of Iquitos, along with the uncontrolled extraction of resources and inadequate land-use policies (Table 5).

Nonetheless, when asked what they saw as the actual reasons for the establishment of the Reserve, the perceptions most mentioned by the interviewed stakeholders were linked to the conservation of biodiversity, natural resources and forests (Table 6). The Iquitos-Nauta road was also frequently mentioned as an underlying cause for both the problems and the development prospects of the area.

Beneficiaries, losers and AMNR managers

The most common concern expressed by all informants was that those most negatively affected by the establishment of the AMNR, at least in the foreseeable future, were those dwelling in the Reserve and its immediate surroundings (Table 7). However, illegal extractors of timber and other natural resources along with other 'outsiders' were also perceived to be negatively affected.

The population of the Iquitos region, research institutions, the tourism industry, and city dwellers were the most

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Table 6 Reasons for the creation of the AMNR, mentioned by the 29 interviewees in Salo (2001), and the number of reasons mentioned by a given interviewee.

Reason	*Number of interviewees mentioning a named reason*		*Number of reasons mentioned by a given interviewee*		
	Informants (n)	*% of total (n = 29)*	*Reasons mentioned (n)*	*Informants (n)*	*Informants (% of all)*
Conservation of forests and natural resources	8	28%	1–2	9	31.03%
Biodiversity conservation	8	28%	3–4	12	41.38%
Plant diversity	7	24%	5–6	7	24.14%
Vicinity and expansion of Iquitos	6	21%	7–8	1	3.45%
Animal diversity	5	17%			100%
Ecological balance	5	17%			
Effects of road	5	17%			
Scientific use	5	17%			

Table 7 Interviewees' ($n = 29$) perceptions of the stakeholders negatively and positively affected by the creation of the AMNR (Salo 2001).

Negatively affected actors	*Interviewees (n)*	*% of total (n = 29)*	*Positively affected actors*	*Interviewees (n)*	*% of total (n = 29)*
Local dwellers	16	55%	Population in the Iquitos region	8	28%
Extractors	7	24%	Research institutions	7	24%
Charcoal producers	4	14%	Tourism	6	21%
			City dwellers	4	21%
			Local dwellers	4	14%

commonly referred to as future beneficiaries (Table 7). Furthermore, the general feeling amongst the informants was that the underlying reasoning explaining the uncertainty felt by local communities vis-à-vis their future was the restrictions on diverse forms of extraction and land use.

Both in the media and in informants' perceptions, the creation of the AMNR was strongly associated with state institutions, most commonly IIAP (62%), followed by the State/Central Government (28%), specific individuals (28%) and INRENA (24%). In reality, INRENA holds the most decision-making power with regard to PA legislation and management, and a number of institutions, organizations, projects and actors at all levels, from local to global, can be considered to be 'stakeholders' of the AMNR.

DISCUSSION

Since the late 1990s, conservation science has witnessed a newly diversified debate between advocates of different PA management approaches ranging from strict preservation to sustainable use (see Terborgh 1999; Brechin *et al.* 2002; Wilshusen *et al.* 2002; Chapin 2004; Romero & Andrade 2004). Locke and Dearden (2005) suggested a reform of the internationally applied IUCN PA categories to distinguish Categories V and VI (emphasizing sustainable development as a conservation tool) from the 'real PA' categories I–IV, and proposed that the former be renamed 'sustainable development areas'.

Many future PAs will inevitably be set up in areas where involving local and regional populations is imperative. In the AMNR, a combination of legally recognized land titles and unresolved entitlements had to be addressed. This is an increasingly common situation, even in Amazonia where distant wilderness areas potentially suited for conservation but yet unprotected are becoming scarcer.

In the case of the AMNR not all places should be open to use, but not all PAs should be, or are, closed to use. While science as a basis for PA management has advanced, the political and economic challenges are less well understood, and rural communities often see PAs just as a means of controlling their land and resources (Hutton *et al.* 2005).

In our case study, one of the initial problems with Reserve establishment was the lack of discussion on different PA categories and their associated implications. A perception of PAs as 'untouchable' was widely held across the stakeholder field, and proved to be an unfruitful basis for further discussion. The main beneficiaries of PA establishment were perceived to be urban dwellers, while rural communities were given little choice but to accept the change in land designation. However, fears of forced expulsion amongst those lacking legal land titles turned into a process of land entitlement that, albeit problematic, seems to have increased the level of community-level commitment to the sustainable management of the Reserve. In fact, the communities expressed their support for the Reserve as conditional on the progress with the entitlement of their traditional lands (Plan Maestro 2005).

The communities also voiced their concerns over their rights to continue using the area's natural resources not only for subsistence but also for income generation. The management plan (Plan Maestro 2005) stressed the need to develop specific guidelines for such activities, and plans are currently underway for the sustainable use of roundwood from the white sand forests, as well as of palm leaves and palm fibres. Although benefits of the PA (other than in the form of environmental services to the city) remain to be seen, the local communities have received technical assistance and shown general approval of the Reserve.

The establishment of the AMNR was scientifically justified by internationally acknowledged studies and inventories carried out by local and international experts. Growing evidence suggests edaphic variation playing an important role in determining biodiversity patterns (Linna *et al.* 1998; Fine *et al.* 2005). The Reserve fills an important gap in the Peruvian PA network in that it hosts both white sand forests (protected for the first time in Peru) and floodplain forests, both providing habitats for rare, endangered and endemic species. The site has the advantage of being both an interesting biodiversity/ecotourism site, whilst also having easy access from Iquitos. Undoubtedly part of its biological uniqueness lies in the level of study it has received in comparison to other similar habitat sites.

The AMNR was established primarily as a priority site for conservation, but also because it encompasses forests that have survived the threats of deforestation, partly safeguarded by state institutional entitlement. The combination of threat and opportunity is one possible driving force for PA establishment in the tropics (Bates & Rudel 2000). In the case of the AMNR, the threats were clearly identifiable, as was the biological conservation value. The opportunity for Reserve establishment existed both in terms of standing forests and possible use values that a PA could provide.

The AMNR highlights the potential for cooperation between international scientists, development agencies, NGOs, local research institutions, national conservation officials and local communities, in finding a middle-ground in which the most important stakeholders can be assured that their interests, and the most pressing conflicts, are being addressed. Influential international conservation NGOs have lost faith in indigenous and other local populations as their natural allies, and have increasingly excluded those populations from their projects (Chapin 2004). Although such NGOs have contributed to the establishment of PAs in Peru (for example Worldwide Fund for Nature [WWF] in Alto Purús National Park), none were directly involved in the AMNR. Rather, the actors involved were generally either local or regional actors, or individual international players.

Finding a path from scientific justification to PA establishment in an area with direct use values essentially requires an understanding of the critical socioeconomic and political processes in which the intended reserve is embedded. Key steps in facilitating this leap, for the AMNR, have been the relatively rapid processes of categorization and elaboration of a management plan.

Nevertheless, the initial establishment of the Reserve was most explicitly linked to benefits for urban populations, whereas once the Reserve was implemented, the focus turned to the rural communities in order to ensure sustainable management whilst addressing their needs for development. This reflects a substantial shift in focus from a scientific justification, and universal (or at least intangible) values linked to biodiversity, towards an approach with more concrete actions both in terms of resource management and property rights resolution.

The importance of local communities as conservationists' allies has to be based on concrete benefits to those involved. This does not mean that only direct material benefits count. As the case of the AMNR demonstrates, the question of access to land and natural resources can be converted from an external threat to an opportunity for local communities to more effectively control their legally recognized traditional usufruct against outsiders.

Aware of the complex problems inherent in the integration of conservation and use of natural resources, we argue that some of the problems initially surfacing in the aftermath of the establishment of the AMNR could have been mitigated by earlier involvement of the local communities. The usufruct linked to traditional lands is central to this realization, both in terms of entitlement and in terms of management planning.

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