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Short communication

Monitoring for conservation in African tropical national parks: An agenda towards policy-relevant science



BIOLOGICAL CONSERVATION

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ABSTRACT

Monitoring as an instrument to quantify human and wildlife activities has been increasingly recognized as fundamental towards efficient biodiversity conservation strategies. Promoting the need to direct management based on scientific guidance, monitoring reflects the rise of evidence-based conservation approaches. Nonetheless, in tropical national parks, monitoring programs can fail to address conservation issues and divert scarce resources away from management priorities. In this manuscript, drawing on the literature and recent empirical observations in seven tropical national parks, I argue that the implementation of monitoring must go beyond the rational model of transfer from science to policy and focus on the processes of co-construction between knowledge and action. An increase in social engineering is needed among partners, services and hierarchical levels of parks to ensure a coherent strategy of knowledge production and its use for decision. I provide concrete recommendations as levers of action towards monitoring efficiency and policy-relevant conservation science.

1. Introduction

Tropical national parks have been widely recognized as fundamental strategic areas for the protection of major biodiversity hotspots and critically endangered species (Beaudrot et al., 2016; Saout et al., 2013). Such areas, however, often face many different threats, political instability, and their effectiveness in protecting nature might be questioned (Miteva et al., 2012; Tranquilli et al., 2014). As an instrument to quantify human and wildlife activities, monitoring is fundamental for natural resources management (Margoluis and Salafsky, 1998; Stem et al., 2005). It attempts to provide scientific guidance towards reliable action, management efficiency and increasing conservation outputs. Hence, monitoring can be considered as a tool for evidence-based conservation (Pullin and Knight, 2001).

However, it has been widely reported that, in developing countries, monitoring efforts are often ineffective in addressing conservation issues (Burton, 2012; Danielsen et al., 2005a; Gardner et al., 2008; Lund, 2013). Rather, monitoring can divert managers from conservation priorities (Sheil, 2001) and exacerbate bureaucracy (Lindenmayer and Likens, 2010a). Although monitoring represents a major investment in "knowing in order to conserve", it often fails to integrate the information produced into decision-making (Danielsen et al., 2003) and appears to be "data rich but information poor" (Ward et al., 1986). Therefore, instead of increasing performance and cost-effectiveness of conservation strategies, monitoring can divert scarce resources (Nichols and Williams, 2006; Sheil, 2001).

Monitoring raises issues related to the interaction between knowledge production and decision-making in environmental policies. How can parks managers and their partners build a policy-relevant conservation science? During the last decade, in order to improve monitoring efficiency, scholars have proposed frameworks and typologies focusing predominantly on long-term ecological measures (*e.g.* Green et al., 2005; Lindenmayer and Likens, 2010b). However, the relationships between knowledge and action, scientific rigor and political value, as well as the social dimension of expertise have been poorly considered (but see literature on participatory and locally-based monitoring Danielsen et al., 2005b, 2010).

Monitoring combines both the need to preserve a scientific authority and the willingness to provide efficient management (Desrosières and Naish, 2002; Lascoumes and Le Galès, 2005; Rottenburg et al., 2015). Therefore, the implementation of monitoring programs relates to contexts where science and policy are difficult to distinguish. In order to frame this "policy-driven science", scholars have proposed different concepts such as regulatory (Jasanoff, 2009), postnormal (Funtowicz and Ravetz, 1993) or contextualized (Gibbons, 2000) sciences. They argue that the quality of expertise is highly related to the stakeholders' capacity to deal with complexity and uncertainty and stress the need to consider the production of scientific facts as

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socially and politically embedded (Carolan, 2006; Latour, 1987, 2004). Such approaches suggest a new model of rationality (Cronje and Fullan, 2003), in which the social drivers involved in the simultaneous construction of science and action appear as the key components of a successful innovation.

In this manuscript, I argue that monitoring and, by extension, evidencebased conservation, must rely on a new concept of the construction and use of knowledge for decision-making. Accordingly, I describe the relevant issues in terms of mediation and propose key objectives to be achieved by national parks managers and their partners. I then offer some practical recommendations as levers of action (Grundmann and Stehr, 2012) towards efficient monitoring programs in Africa.

2. Monitoring in African tropical national parks

My analysis and propositions rely on a combination between the existing literature and some recent observations made in the context of a larger project over seven national parks: Taï (Ivory Coast), Campo Ma'an (Cameroon), Odzala-Kokoua (Republic of Congo), Salonga and Virunga (Democratic Republic of Congo), Bwindi (Uganda) and Gunung Leuser (Indonesia). I surveyed all monitoring programs involving data collection i) on a permanent or regular basis, ii) still running, iii) inside or around the park in a 20 km buffer zone, iv) oriented towards management and/or research. I focused on scientific monitoring programs measuring the state of environmental issues for management purpose rather than on programs evaluating human resources management, accountability, administration or logistic (see Mascia et al., 2014 or Stem et al., 2005 for typologies of monitoring and evaluation). Appendix 1 lists all the monitoring programs identified in the considered parks between 2014 and 2016. Fig. 1 is based on these observations and provides a simple illustration of what I consider here as the main components of monitoring programs in such areas.

Although mainly focusing on ecosystems and wildlife, monitoring in African national parks also targets the production of data on illegal activities and local communities, involve a variety of organizations such as research institutes, non governmental organizations, private foundations or governmental authorities (Fig. 1). Parks and their partners do not only run programs within the parks' borders but as well in their surrounding areas. Such programs can be conducted on a permanent or a regular basis or for short time periods. In theory, when conducted for management purpose, monitoring in national parks aims at developing tourism, empowering communities and orienting law enforcement.

In a previous paper (Vimal et al., in press), we proposed a comprehensive analysis of the nature and role of these monitoring programs. Drawing on their limitations to guide management, this manuscript shows how they contribute to promote nature conservation (for instance by deciding what, where and how to protect) and to provide parks with a material dimension (monitoring automatically involves the provision of funds, equipments, human resources, etc.). We therefore conclude on the importance of the socio-political dimension of expertise and stress the need to "review the conditions under which a policyrelevant conservation science can be implemented".

3. Dealing with social issues

I argue that, by focusing on a linear model of knowledge transfer, conservationists underestimate the social forces and drivers underlying the production and use of monitoring for action and fail to provide policy-relevant knowledge (Game et al., 2015; Mathevet and Mauchamp, 2005). To have an impact on management, expertise for nature conservation should rather be implemented following a model of co-construction of knowledge production and decision making. This suggests that science and action are build simultaneously, influence each-others and thus become more relevant. It requires that environmental practitioners pay more attention to the complex socio-political processes involved in the construction and mobilization of policy-based evidences. In such "reflexive politicization" (Strassheim and Kettunen, 2014), stakeholders surpass the framework of data objectivity as a base for rational public action.

Concretely speaking, national parks should rely more heavily on social engineering in order to build a coherent expertise and make monitoring fully integrated to management strategies. "Measuring is not protecting" (Sheil, 2001). Proactive mediation is needed across services (monitoring, law enforcement, community), partners (NGOs, governmental authorities, research institutes) and hierarchical levels (field agents, officers, heads of service and managers). Parks must improve their capacity to plan knowledge production and actively use it to support, communicate and implement decision.

3.1. Planning a strategy for knowledge production

Overall, monitoring programs should be integrated through a

Features of interest	When
tions Wildlife presence Ecological dynamics Great ape ecology, health, behavior	Regular Permanent Temporary
Daily elephant displacement Park encroachment	Different steps
Ivory trade Human/wildlife conflict	Planning Data collection
Community forests and plantations Community behavior Community livelihood	Data analysis Results interpretation Decision Communication Action
Data collection methods	Action
Interview, Questionnaire, Focus group, Villager and agent report, Participatory mapping, Terrestrial transact. Clearing observation. Camera tran	Where
	tions Wildlife presence Ecological dynamics Great ape ecology, health, behavior Illegal activity signs Daily elephant displacement Park encroachment Ivory trade Human/wildlife conflict Community forests and plantations Community behavior Community livelihood Data collection methods Interview, Questionnaire, Focus group, Villager and agent report, Participatory mapping, Terrestrial transect. Clearing observation. Camera transition

Community development Law enforcement Research and monitoring

> errestrial transect, Clearing observation, Camera trap, Vegetation plots, Daily wildlife tracking, Aerial survey, Law enforcement patrol, Remote sensing

Inside the park Around the park In part of the park

Fig. 1. The main components of monitoring programs in tropical national parks in Africa.

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