Biological Conservation 212 (2017) 337–348

Contents lists available at ScienceDirect

Biological Conservation

journal homepage: www.elsevier.com/locate/biocon

# From displacement activities to evidence-informed decisions in conservation

Robert L. Pressey*, Rebecca Weeks, Georgina G. Gurney

*Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University, Townsville, QLD 4811, Australia*

ARTICLE INFO

*Keywords:*
Conservation science
Evidence-based conservation
Conservation planning
Conservation policy
Protected-area management

ABSTRACT

This paper highlights a disjunction between the basic motivation of conservation planners, policy-makers, and managers, which is to make a positive difference for biodiversity, and many of our day-to-day activities, which are tangential (at best) to the goal of avoiding biodiversity loss. At the core of this problem is the use of conservation measures (inputs, outputs, and outcomes) that do not explicitly address conservation impact, and thus risk undermining its achievement. These measures are used to formulate policy targets and operational objectives, gauge progress towards them, and identify priorities for action. In particular, the pervasive use of representation of biodiversity features as a sole basis for identifying priorities, and the considerable global effort directed towards increasing protected-area extent and assessing protected-area management effectiveness, exemplify that much conservation decision-making is founded more on belief systems than evidence. Measures such as the extent or representativeness of protected areas risk misdirecting conservation actions towards areas of low impact and misleading decision-makers and the public about conservation progress. To promote more effective, evidence-informed decision-making, analytical evidence can and should be used to test and refine decision-makers' implicit models of the world, focusing on predicting conservation impact - the future difference made by our future actions - to increase our effectiveness and accountability.

## 1. Introduction

When frustrated, thwarted, or faced with conflict, animals exhibit behaviour - termed displacement activity - out of context with, and apparently irrelevant to, their prevailing situations (Delius, 1967). Displacement activities by birds under threat or in conflict include feeding and nest-building movements, preening, and sleep, interpreted as outlets through which frustrated drives can be expressed (Tinbergen, 1952). Displacement activities have been described in response to stress in non-human primates (Maestripieri et al., 1992) and humans (Mohiyeddini and Semple, 2013). Could it be that conservation professionals exhibit collective forms of displacement activity? Have we adopted irrelevant responses to the irreconcilable tension between needing to save biodiversity, and the difficulty in doing so in the face of the combined erosive force of human numbers, extractive activities, invasive species, and climate change? Are we retreating to activities that are immediately attainable, personally profitable, and politically advantageous at the expense of helping biodiversity to persist?

Whitten et al. (2001) asked a similar question of conservation biologists. They also posed a more specific and confronting question "… if conservation biology is ineffective in helping to stop something as globally significant as the devastation of Indonesian forests, then what, please, is the point of it?" This might seem a harsh criterion by which to judge a scientific field but, in the end, conservation science will be judged by how much difference it has made, not by the shorter-term criteria of publications, conference presentations, research grants, and personal advancement. Conservation policy will be judged in the same way, not by the achievement of protected-area targets unrelated to making a difference (Pressey et al., 2015). The same is true of protected-area management, currently assessed by agreed criteria (Leverington et al., 2010) that appear unrelated to saving biodiversity (Coad et al., 2015). These three areas of conservation endeavour are analogous to medical research, policy, and practice, which would be judged harshly if they failed to reduce human suffering and death.

This paper examines whether conservation policy, planning, and management are making a positive difference for biodiversity, or whether they constitute displacement activities in the face of biodiversity loss. Section 2 defines types of "measures". We use this term to refer to policy targets, such as those for protected areas under the Convention on Biological Diversity (Convention on Biological Diversity, 2010), quantitative objectives for operational decisions in protected-area management and identification of priorities through conservation planning (Pressey and Bottrill, 2009), and the application of targets and objectives to gauge progress in conservation. Commonly used measures are extent or representativeness of protected areas (Pressey et al., 2015). Section 3 critically reviews the types of measures that dominate

* Corresponding author.
*E-mail address:* bob.pressey@jcu.edu.au (R.L. Pressey).

http://dx.doi.org/10.1016/j.biocon.2017.06.009
Received 4 April 2016; Received in revised form 31 May 2017; Accepted 9 June 2017

decision-making in conservation, using the lens of conservation impact, which is the difference made by conservation actions (Ferraro and Pattanayak, 2006). Section 4 revisits the notion of displacement activities, concluding that, at least analogously, they characterise much of our decision-making, which is founded more on belief systems than evidence. Sections 3 and 4 highlight a disjunction between, on one hand, the basic motivation of policy-makers and conservation planners and managers and, on the other hand, many of our day-to-day activities. It seems reasonable to say that people working in conservation have set out to make a positive difference, but this motivation is not expressed in much of our work. As a consequence, we oversee avoidable loss of biodiversity. Section 5 proposes levels of evidence to replace belief systems in conservation and maps a way towards policy, planning, and management that directly address the fundamental goal of conservation impact. The broad goal of the paper is to contribute to discussion about how conservation decision-making can be more effective in minimising loss of biodiversity. The focus is on decisions about spatial management through formal protection and application of conservation actions within and outside protected areas (hereafter "conservation areas").

## 2. Types of conservation measures

This section defines four broad types of measures – inputs, outputs, outcomes, and impacts – with outcomes separated into three sub-categories (Fig. 1A). The definitions follow established terms in performance management (DAC, 2002; Margoluis et al., 2013) and impact evaluation (Ferraro, 2009). Placing measures into categories has two advantages. First, it groups measures that use data in similar ways to formulate targets and objectives, gauge progress, and set conservation priorities. Second, it helps to understand the roles of different measures in decision-making and their functional relationships to one another (Margoluis et al., 2013; Pressey et al., 2015).

Inputs are the resources invested in conservation programs, usually in the form of staff, time, and money. Outputs are the concrete, countable products of conservation actions. Examples are numbers or total $km^2$ of protected areas, numbers of boats available for patrols, km of fencing, or numbers of pest animals culled. At the operational levels of conservation programs and management of protected areas, outputs are things that can be safely promised in return for funding. Outcomes are the observed or assumed effects of conservation outputs. The most immediate and easily measured outcomes are those related to representation (or sampling) of species, ecosystems, or other elements of biodiversity (hereafter "features"). Outcomes in terms of levels of threats to biodiversity are meant to indicate the effectiveness of actions in separating biodiversity features from processes that jeopardise their persistence; this separation is implied, but not guaranteed, by representation in conservation areas. Outcomes for the state of biodiversity convey information of more direct interest than the previous measures: they can reflect the responses of features to actions, which are not always proportional to threat reduction (Tulloch et al., 2015). Outcomes for threats and biodiversity are typically measured only within conservation areas or systems of conservation areas, at a single point in time or as trends over time (Pressey et al., 2015). The "impacts" of Margoluis et al. (2013) are categorised here as outcomes for biodiversity because they are not necessarily based on a comparison between conditions inside conservation areas and those outside.

Impacts, as defined here, are the "value added" of conservation: the effects of actions on one or more intended (or unintended) outcomes, over and above the counterfactual (Ferraro, 2009; Maron et al., 2013) of no action or a different action (Ferraro and Pattanayak, 2006). Impacts are therefore measures of difference (Fig. 1B) expressed, for example, as percentages of protected-area systems that avoid loss of forest cover (Andam et al., 2008) or the amount of potential loss of biodiversity in a region that was avoided by actions (Pressey et al., 2015). This definition brings conservation into line, as proposed by Ferraro and Pattanayak (2006), with very extensive applied research on impact evaluation in development aid, medicine, and education (Banerjee and Duflo, 2009; White, 2009). Importantly, this definition of impacts contrasts with that in the results chains of performance management (Margoluis et al., 2013) in which "impacts" are eventual outcomes for biodiversity (Fig. 1A).

Of the methods used to estimate impacts (Ferraro and Hanauer, 2014), perhaps the most intuitive is matching. Matching involves choosing sites within conservation areas and matching each to a site outside, taking care that the inside-outside pairs are very similar in characteristics (e.g. slope, distance from markets, extent of unaltered habitats, inherent suitability for selected species) that could affect conditions of interest (e.g. forest cover, abundance of vulnerable species). The conditions of the outside sites are then estimates of the expected conditions of their matched inside sites had conservation actions not been taken (e.g. Andam et al., 2008).

Only impacts allow decision-makers to understand how much difference they have made or could make. The key distinction between impacts (Fig. 1B) and outcomes (Fig. 1A) is the estimation of impacts by comparing conditions within conservation areas to those expected without conservation actions (Pressey et al., 2015). Most impact evaluations have been retrospective, providing lessons for the future; but planners and managers must also move towards predicting impacts – essentially predicting conditions across regions with and without conservation actions – to identify priorities for action that reflect the potential to avoid future loss of biodiversity.

The reliability of impact estimates depends on how rigorously counterfactual conditions are identified. Comparisons between protected sites and those just outside protected-area boundaries (Bruner et al., 2001), for example, can be unreliable for several reasons. First, sites just outside boundaries can have much higher probabilities of losing biodiversity than those inside if boundaries follow, as they often do, discontinuities such as breaks in slope, changes in soil type, or edges of reefs. The resulting estimates of impact can be substantially inflated (Andam et al., 2008; Geldmann et al., 2013). Second, across-boundary comparisons are affected by localised interaction effects, either through protection supplementing biodiversity outside (Harrison et al., 2012) or displacing extractive activities from within conservation areas to areas outside (Bode et al., 2015). Counterfactual estimates can also be simply misconceived. The measure of "true" conservation progress (McDonald-Madden et al., 2009) is based on a ratio of conservation to loss of features over a defined period, exemplifying what Game et al. (2014) described as a good solution to the wrong problem. The measure fails to convey information about impacts because it does not estimate how much loss would have occurred in the absence of conservation actions and how much of that loss was avoided.

Even rigorous assessments of impacts, however, come with assumptions and limitations. For example, some protected sites might have no good outside matches (Pfaff et al., 2009), and there is a tradeoff between quality of matches and number of matched sites (Ahmadia et al., 2015). Avoided deforestation might under- or overestimate impact related to variables not detectable from remote sensing, such as density of understorey important to some animal species (Vincent, 2016), although this problem is avoided by evaluations based on field surveys (Gaston et al., 2008; Geldmann et al., 2013). While the effects of protection on local displacement of threats (also referred to as "spillover" or "leakage") are understood (Ewers and Rodrigues, 2008) and can be accounted for in counterfactual estimates (Andam et al., 2008), some displacement could extend well beyond study regions, even internationally (Henders and Ostwald, 2012). Further, identifying potential mechanisms for observed impacts and reaching conclusions about causality is not always straightforward (Ferraro and Hanauer, 2014). Notwithstanding these limitations, the considerable advantage of impacts over other measures is that they reflect the basic purpose of protected areas. Like any emerging area of research and development, evaluation of conservation impacts will become progressively refined, and more quickly if impacts become a focus of science and policy.