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On the accuracy of conservation managers' beliefs and if they learn from evidence-based knowledge: A preliminary investigation

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ABSTRACT

Despite the significant impetus placed on the need for conservation managers to base their decisions on evidence-based findings, few studies have compared the accuracy of "evidence" versus experience-based knowledge. Furthermore we are not aware of any study that has tested the willingness of managers to change their beliefs after being exposed to evidence-based findings. Here, we tested nine managers' beliefs before-and-after being shown findings from an evidence-based study. The questions centered on the effectiveness of 'Working for Water' (WfW) in reducing invasive alien plant cover in two large catchment projects over a seven year period, as well as the managers' forecasts of WfW's effectiveness of reducing invasive alien plant cover, and the factors that underpin its effectiveness. We also assessed the financial cost of implementing the evidence-based assessment. We found that in comparison to the evidence-based findings, the managers underestimated the ineffectiveness of operations in reducing invasive alien plant cover in the one catchment and overestimated the ineffectiveness of the other catchment. All the managers whose estimates differed from the evidence-based findings were willing to change their beliefs. Surprisingly, however, when it came to forecasting WfW's effectiveness in the catchments, all the managers, with the exception of one project manager, were unwilling to reduce their optimistic estimates of the time required to control invasive alien plants from the two catchments. With regard to the drivers of effectiveness, the managers ranked their performance as the most important criterion whereas the data model emphasized variables related to site suitability for alien plant growth. Finally, we showed that it would only cost between 0.33% and 1.67% of the two projects' annual budgets to assess all sites, depending on the frequency of the monitoring. This preliminary investigation highlights how evidence-based findings alone, even if presented and explained to managers, might not result in managers learning and updating their beliefs.

1. Introduction

Since the start of this century increasing attention has been placed on the need for conservation managers to base their decisions on evidence-based findings (e.g., Sutherland et al., 2004). Despite this, a large proportion of conservation managers still do not use evidence-based knowledge in making important decisions (Pullin et al., 2004; Pullin and Knight, 2005; Ntshotsho et al., 2010). Instead, they manage, as Longcore et al. (2007) suggest, by assertion, largely relying on their personal experience and commonsense. Some of the most frequently cited reasons why managers behave in this way are lack of available evidence-based findings followed by cost and time constraints (Pullin et al., 2004; Pullin and Knight, 2005).

The infrequent use of evidence-based knowledge is seen as problematic owing to the fact that all people, including conservation managers, rely on mental shortcuts (heuristics) which are prone to a range of cognitive biases (Tversky and Kahneman, 1974). For example anchoring (overemphasizing the importance of initial information), optimism bias (viewing information in a favorable light), the availability heuristic (overemphasizing the importance of information that first comes to mind), representativeness (small samples resemble the larger population), and the illusion of control (belief that one has more control over future events than they really do) (Sternberg, 2003). Biases can result in managers overestimating what they are capable of achieving and underestimating the

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likelihood of failure (Lovallo and Kahneman, 2003). The use of evidence-based knowledge by managers is believed to counteract decision-making biases (Sutherland et al., 2004).

Evidence-based knowledge, however, is not infallible. Like experience based knowledge, it is vulnerable to error, subjectivity and biases of interpretation (Hilborn and Mangel, 1997). In defense of heuristics and common-sense, Gigerenzer and Brighton (2009) argue that more accurate decisions can often be made with less information and processing time using simple heuristics instead of complex models and extensive information gathering. For example, within a conservation planning context, Cowling et al. (2003) argued the strengths and weaknesses of both approaches, and suggested that both contribute to improving the effectiveness of decision making.

Furthermore, a critical constraint – that has been given almost no attention – is whether conservation managers are actually willing to change their belief if exposed to evidence-based findings. Since acquiring evidence-based knowledge can be expensive (Grantham et al., 2009), it is important to understand if and when it changes managers' beliefs and how their biases, if any, influence their beliefs. This paper investigates this issue using a case study from South Africa's 'Working for Water' (WfW) programme.

Large numbers of alien plant species, including many trees and shrubs (Henderson, 2001), have invaded South African ecosystems (Henderson, 2007). Some of these plants reduce scarce water supplies and negatively affect biodiversity and the functioning of riparian zones (van Wilgen et al., 2008). Growing awareness of the problem resulted in the formation of the government-funded invasive alien plant control programme WfW in 1995.

WfW is arguably the world's most ambitious alien plant control programme (Koenig, 2009), yet it does not monitor the post-treatment alien plant cover of sites. Instead it measures alien plant cover prior to a treatment (Levendal et al., 2008, van Wilgen et al., 2012 As part of a suite of suggestions, Levendal et al. (2008) recommend that WfW monitor the post-treatment cover of its treatment sites, so that it can measure its effectiveness over time, and consequently adapt its strategies if needs be.

McConnachie et al. (2012) is the first study to provide quantitative evidence of the effectiveness of clearing by WfW. It assessed the effectiveness of WfW in reducing invasive alien plant cover over a seven year period in the Kouga and Krom river catchment projects in the Eastern Cape Province. The study assessed change in invasive alien plant cover by comparing post-treatment cover with the first recorded pre-treatment cover across all 740 of the two project's treatment sites. The key finding was that post-treatment control was in many cases ineffective; it would take 54 and 695 years to clear the remainder of the two respective catchments assuming that no further spread would occur. In addition, it cost over 2.4 times more to reduce invasive alien plant cover in these projects than the least optimistic estimate made in previous studies (Le Maitre et al., 2002).

In this paper we ask three questions. Firstly, how do the initial beliefs of the WfW managers responsible for managing the aforementioned projects differ prior to seeing the evidence-based findings in McConnachie et al. (2012), and secondly are managers willing to change their beliefs after being exposed to these findings. These two questions centered on the historical effectiveness of WfW in reducing invasive alien plant cover in the two catchment projects as well as the managers' forecasts of WfW's future effectiveness, and the factors that underpin WfW's effectiveness. Our third question focused on the financial costs of acquiring evidence-based knowledge. Specifically, we asked what proportion are these costs of the overall annual project budgets.

2. Methods

2.1. Study area and background to the projects

We conducted our study in the Krom (1556 km^2) and Kouga (2426 km^2) river catchments in the Eastern Cape Province of South Africa, specifically, in those parts of each catchment where WfW had implemented projects to clear invasive alien plants (Fig. 1). These two projects are among WfW's oldest (operating since 1995) and largest in terms of hectares cleared and jobs created.

WfW managers allocate contracts within each project that specifies a treatment site of alien plant-invaded land that must be cleared within a month. Each treatment site is assigned to a team comprising a team leader (contractor) and 10–15 laborers, recruited from the large numbers of unemployed people in local towns. Each project has, on average, five to seven operational clearing teams at any time.

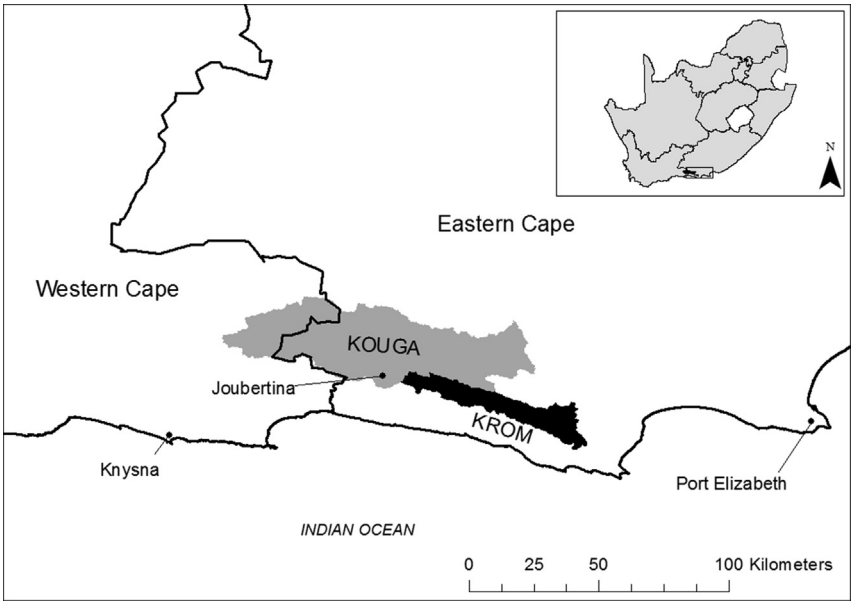

Fig. 1. Location of the Kouga and Krom river catchments within the Eastern Cape Province, South Africa.