Biological Conservation 214 (2017) 168–175

Contents lists available at ScienceDirect

Biological Conservation

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

Designing protected area networks that translate international conservation commitments into national action

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ARTICLE INFO

Keywords:
Convention on biological diversity
Local communities
Marxan
REDD+
Systematic conservation planning
Tropical forest conservation

ABSTRACT

Most countries have committed to protect 17% of their terrestrial area by 2020 through Aichi Target 11 of the Convention on Biological Diversity, with a focus on protecting areas of particular importance for biodiversity. This means national-scale spatial conservation prioritisations are needed to help meet this target and guide broader conservation and land-use policy development. However, to ensure these assessments are adopted by policy makers, they must also consider national priorities. This situation is exemplified by Guyana, a corner of Amazonia that couples high biodiversity with low economic development. In recent years activities that threaten biodiversity conservation have increased, and consequently, protected areas are evermore critical to achieving the Aichi targets. Here we undertake a cost-effective approach to protected area planning in Guyana that accounts for in-country conditions. To do this we conducted a stakeholder-led spatial conservation prioritisation based on meeting targets for 17 vegetation types and 329 vertebrate species, while minimising opportunity costs for forestry, mining, agriculture and urbanisation. Our analysis identifies 3 million ha of priority areas for conservation, helping inform government plans to double the current protected area network from 8.5 to 17%. As part of this, we also develop a new technique to prioritise engagement with local communities whose lands are identified as important to conservation. Our study both provides a scientifically robust, politically acceptable protected area expansion strategy for Guyana, and illustrates the importance of conservation planning at the country-scale to translate international commitments into national action.

1. Introduction

Protected areas form the cornerstone of global biodiversity conservation efforts, and today there are > 200,000 terrestrial protected areas worldwide (Bruner et al., 2001; Chape et al., 2005; UNEP-WCMC and IUCN, 2016). In recognition of this, signatories to the United Nations Convention on Biological Diversity (CBD) have committed through Aichi Target 11 to ensure that 17% of the terrestrial realm is protected by 2020, with a focus on establishing protected areas and other effective area-based conservation measures (OECMs). Implementing this commitment involved each country setting a national target, with most adopting 17%. However, with less than three years until 2020, only 14.8% of global land area is protected, representing a total shortfall of 3.1 million km^2 (UNEP-WCMC and IUCN, 2016), an area nearly the size of India. This shortfall is because over half of countries are yet to reach their national targets (World Bank, 2017), and while between 1990 and 2012 the area of the global conservation estate grew rapidly, progress has since plateaued (UNEP-WCMC and

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http://dx.doi.org/10.1016/j.biocon.2017.08.024
Received 25 January 2017; Received in revised form 20 July 2017; Accepted 14 August 2017
Available online 21 August 2017

IUCN, 2016). Consequently, for countries falling short of their target, up-to-date protected area expansion plans are needed.

Signatories to the CBD have recognised that for protected areas to be effective, they must be well-connected, ecologically representative and conserve areas of particular importance for biodiversity (CBD, 2010). This is against the backdrop that many existing protected areas are biased towards locations that are less important for biodiversity and/or on remote and economically unproductive land (Brooks, 2014; Joppa and Pfaff, 2009; Venter et al., 2017). Therefore, the Aichi targets have created an opportunity for the conservation science community to guide protected area expansion, as there is a real need to develop evidence-based plans that prioritise biodiversity (Watson et al., 2016).

Several global spatial conservation prioritisations have been conducted (e.g. Butchart et al., 2015; Larsen et al., 2011; Pollock et al., 2017; Venter et al., 2014), and these provide broad insights into the optimal locations for future protection at the international scale. However, as Aichi Target 11 is implemented at the national-level (CBD, 2010), and as this is the scale most relevant for land-use policy development and delivery, national-scale spatial conservation prioritisations are needed. To undertake these, under the CBD, government agencies must develop National Biodiversity Strategy and Action Plans (NBSAPs), which, where necessary, include a roadmap to achieving the Aichi targets, including "…integrating biodiversity into spatial planning exercises through the mapping of biodiversity ecosystem services and through systematic conservation planning" (CBD, 2010). Systematic conservation planning is one of the most transparent and robust methods for informing spatial planning, as it aims to maximise conservation benefits while minimising impacts on other stakeholders (Margules and Pressey, 2000). In addition to global analyses, systematic conservation planning has been extensively used at the local, regional and landscape level (e.g. Smith et al., 2008; Venter et al., 2013). However, despite national CBD targets, it is less commonly applied at the national-level (Di Minin et al., 2017), even though this is generally the scale most relevant for the government agencies charged with delivering CBD targets.

To illustrate the benefits of such country-wide analyses, here we describe a national-scale systematic conservation planning process for Guyana, which was led by the main government agency for protected areas in collaboration with a range of stakeholders and conservation scientists. Our plan sought to identify priority areas for protected area network development in Guyana, to adequately represent biodiversity while accounting for other land-uses. Guyana forms part of Amazonia and combines economic poverty with some of the highest global levels of biodiversity (Jenkins et al., 2013), and lowest deforestation rates (Hansen et al., 2013). Over 80% of the land area is covered with tropical forest. However, as in many parts of South America, deforestation rates have risen over the last decade, primarily as a result of gold mining (Fig. 1; Howard et al., 2011; Laing, 2015). This was partly because forests produced little government revenue compared with mining. This situation changed in 2009, when Norway committed up to $250 million to Guyana over an initial five-year period for Reducing Emissions from Deforestation and forest Degradation (REDD+) (Gutman and Aguilar-Amuchastegui, 2012). The expectation was that the funds can shift the economy away from a reliance on resource extraction towards a more sustainable and low-carbon model (Office of the President, 2013). Therefore, under the REDD+ agreement, Guyana committed to fulfilling its CBD obligations, through the implementation of a national conservation planning process. Both the REDD+ agreement and Aichi Target 11 stipulate that protected areas should be established and managed in close collaboration with indigenous and local communities (CBD, 2010; Gutman and Aguilar-Amuchastegui, 2012; Office of the President, 2013), and this is highly relevant in Guyana because community lands cover c. 15% of the country (Fig. 1), most of which are owned by indigenous Amerindians.

The existing protected areas in Guyana were not selected systematically, representing just 8.5% of the land area, of which 3.1% is a community conservation area. In 2016, the President of Guyana pledged an additional 2 million ha of protected area would be established across the country, thereby addressing both the shortfall in the 17% Aichi Target, and making an important contribution to the reduction in deforestation required to receive performance-related REDD + payments. To guide this process, we formed a group of stakeholders from Government of Guyana agencies, academia, and Non-Governmental Organisations, and used a systematic conservation planning approach. We identify priority areas to achieve conservation targets for 329 species and 17 vegetation types, while minimising opportunity costs (i.e. the choice of the best lower cost alternative) from the forestry, mining and agricultural industries (Margules and Pressey, 2000; Venter et al., 2013). Given the importance of local communities, we also developed a method to identify the most important community lands for meeting conservation targets. This provides a technique to help prioritise the engagement process for free prior and informed consent during the creation of new protected areas. Our study serves as a benchmark for countries looking to undertake national-scale spatial conservation prioritisations to expand their protected area networks.

2. Methods

The study was initiated by the Government of Guyana's Protected Areas Commission in collaboration with academics who joint-led the systematic conservation planning process. Our team quickly grew to consist of representatives from all of the non-governmental conservation organisations in Guyana, including Conservation International, WWF, and the Iwokrama International Centre for Conservation and Development. We consulted with stakeholders and policy makers during every stage of the planning process to ensure the spatial prioritisation remained relevant (Smith et al., 2009). This began with a workshop formed of all government agencies and stakeholders responsible for forestry, mining, natural resource management, land-use planning, environmental protection, and indigenous peoples as well as our study team, and initial feedback was given on preliminary analyses. Recommendations from these consultations were that the conservation prioritisation should: i) focus on Guyana's habitats and biodiversity, explicitly including threatened species; ii) incorporate opportunity costs; and iii) consider the role of community lands. The stakeholders also agreed that due to data availability, species distribution maps would need to be developed, and that the planning analysis should use Marxan, a software package designed to identify sets of priority areas that meet quantitative targets for specified conservation features, while minimising costs and maintaining connectivity (Ball et al., 2009). All stakeholders were kept up-to-date and remained involved as the spatial conservation prioritisation was developed and completed.

2.1. Habitat and species distributions

The conservation features we used in the analysis were 17 vegetation types, as classified in the Guyana national vegetation map (ter Steege, 2001), and all of Guyana's vertebrates for which range maps were available or could be developed. Faunal communities in many parts of Guyana have not been extensively studied, so we generated species distribution models to fill these gaps. We assessed data availability for all the c. 1000 terrestrial vertebrate species known to occur in Guyana and produced a species distribution model if ≥ 15 spatially referenced records had been collected. Species locality data were obtained from the Global Biodiversity Information Facility and published studies and rapid biodiversity assessments (Appendix Table A1). To increase the sample size for each species and, therefore, the reliability of our models (Elith et al., 2006; Hernandez et al., 2006), we widened