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Accounting for conservation: Using the IUCN Red List Index to evaluate the impact of a conservation organization

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ABSTRACT

Global and project-level biodiversity indicators have received considerable attention, but indicators of the conservation actions and impacts of programmes and institutions appear to be under-developed. The IUCN Red List Index (RLI) has potential to be a useful indicator at an organizational-level to evaluate long-term impact of conservation on the extinction risk of species, thereby supporting institutional decision-making and communications. However, it has not yet been tested for its utility in tracking changes in extinction risk of a set of species targeted specifically by an individual conservation agency. Here, we examine the feasibility of using the RLI as one metric of the conservation impact of the Durrell Wildlife Conservation Trust, a conservation charity which runs multi-decadal programmes on a modest number of globally threatened terrestrial vertebrate species. Of 17 target amphibian, bird and mammal species, eight underwent improvements in Red List category (reductions in extinction risk) owing to conservation. This drove a 67% increase in the value of the Red List Index between 1988 and 2012. This contrasts with a 23% decline in a counterfactual RLI showing projected trends if conservation had been withdrawn in 1988. For organizations that target sets of species with circumscribed geographic distributions and that are regularly assessed by the IUCN Red List, the RLI is a useful indicator for measuring and demonstrating long-term conservation impact to technical and non-technical audiences.

1. Introduction

Monitoring and evaluation is an increasingly integral component of biodiversity conservation practice and policy. It enables the setting of management and policy objectives, adaptation of interventions, measurement of effectiveness and demonstration of results to donors, supporters and other stakeholders (Yoccoz et al., 2001; Stem et al., 2005; Sutherland et al., 2010; Jones et al., 2013). It requires the development of individual and sets of indicators, the desirable properties of which depend on the monitoring objectives (Jones et al., 2013). In general terms, however, indicators should be scientifically robust, objectively verifiable, practical to implement, cost-effective and easy to communicate to non-technical as well as technically-minded audiences. Indicators that are scalable between (and therefore informative at) different levels of conservation implementation such as projects, programmes and institutions, nationally and globally are particularly valuable. Whilst the development of indicators at global and project-levels has received much attention (e.g. Conservation Measures Partnership's Open Standards for the Practice of Conservation (CMP, 2004); Cambridge Conservation Forum's Harmonizing Measures of Conservation Success (Kapos et al., 2008)), indicators of conservation actions, outputs and impacts at programme and institutional-levels appear to be particularly under-developed.

An important suite of policy-relevant indicators (Walpole et al., 2009) was developed to measure biodiversity status, threats and responses at the global-level in response to the Convention of Biological Diversity's target to reduce the rate of biodiversity loss by 2010 (and these indicators were used to demonstrate that it was not met: Butchart et al., 2010). These formed the basis for a revised set (CBD, 2010a) recommended for tracking progress against the 20 'Aichi Targets' in the CBD's Strategic Plan on Biodiversity (CBD, 2010b). Among these, Target 12 states that "*By 2020, the*

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extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained" (CBD, 2010b). The principal indicator used to report on progress towards this target is the IUCN Red List Index (RLI), which shows trends over time in the aggregate extinction risk of sets of species (Butchart et al., 2004, 2005, 2007).

The RLI is calculated from data in the IUCN Red List of Threatened Species (IUCN, 2013a), which is considered the most authoritative and objective system for categorizing the extinction risk of taxa (Hambler, 2004; de Grammont and Cuarón, 2006; Rodrigues et al., 2006). Species are assessed against criteria with quantitative thresholds for geographic range and population size, structure and trends (IUCN, 2012) and then assigned to categories of extinction risk (ranging from Least Concern through to Critically Endangered and Extinct) . The RLI is based on the proportion of species that move through the IUCN Red List categories between periodic assessments, either away from or towards extinction, as a result of genuine improvements or deterioration in status. It excludes changes in category resulting from taxonomic revisions, changes to the IUCN Red List criteria, or improvements in knowledge (Butchart et al., 2004, 2006b, 2007). Index trends therefore relate to how survival probability of a set of particular species changes over time.

Global RLIs showing trends in extinction risk for all species within a particular taxonomic group have been calculated for the world's birds (Butchart et al., 2004, 2010; BirdLife International, 2013b), amphibians (Stuart et al., 2004), mammals (Schipper et al., 2008), and warm water reef-building corals (Carpenter et al., 2008), bringing global attention to the concerning declines in amphibians and corals in particular. However, there are no other groups in which all species have been assessed against the IUCN Red List criteria at least twice, although reassessments of all conifers, cycads, mangroves, seagrasses, cartilaginous fishes, lobsters, crayfish and freshwater crabs are planned or underway (IUCN, 2013b). Further, hyperdiverse invertebrate orders such Coleoptera, Diptera and Hymenoptera are particularly under-represented within the Red List (Cardoso et al., 2012), although regionally comprehensive assessments are now underway for some groups within the latter, and for other invertebrate groups. To account for the under-representation of these and other highly speciose and poorly known taxonomic groups a sampled approach to red listing has been developed (Baillie et al., 2008; Lewis and Senior, 2011), through which a representative sample of species have been assessed for reptiles, fishes, butterflies, dragonflies, and plants (monocots, legumes, bryophytes and ferns), with other invertebrate assessments underway. Repeated assessments will allow sampled RLIs to be developed in due course (IUCN, 2013b).

National RLIs have also been developed based on repeated application of the Red List categories and criteria at a national scale in order to assess national extinction risk, including for Australia (Szabo et al., 2012), Sweden (Gärdenfors, 2010), Finland (Juslen et al., 2013) and Paraguay (López, 2011). Global RLIs have been disaggregated to show trends in different biogeographic realms (Butchart et al., 2004, 2005), for different taxonomic groups (BirdLife International, 2013a), in relation to different international agreements (e.g. Ramsar Convention on Wetlands, the Agreement on the Conservation of Albatrosses and Petrels: BirdLife International, 2013a; UN Millennium Development Goals: UN, 2013), to show the contribution of different threats (Butchart, 2008; McGeoch et al., 2010; Almond et al., 2013), to assess the effectiveness of protected areas (Butchart et al., 2012), and to quantify the impact of conservation action (Hoffmann et al., 2010).

The latter study contrasted RLIs for birds, mammals and amphibians with alternative 'counterfactual' RLIs that excluded those improvements in status driven by conservation interventions that led to species being downlisted to lower categories of extinction risk. The magnitude of this difference underestimated the impact of conservation as it does not take into account species which would have deteriorated in status without conservation efforts (Hoffmann et al., 2010). To fully evaluate the impact of conservation actions, it is necessary to ask what would have happened if there had been no intervention, i.e. a counterfactual outcome that is not observed (Ferraro and Pattanayak, 2006). A counterfactual approach to programme impact evaluation has been broadly lacking within the conservation sector, hampering efforts to properly assess the outcomes of conservation funding programmes, intervention types, projects and institutions (Ferraro and Pattanayak, 2006).

A number of impact evaluation methods are available to disentangle the effects of the intervention from the wider dynamics of the system, including randomized controlled trials and quasi-experimental designs such as "natural" experiments (e.g. Rosenzweig and Wolpin, 2000), instrumental variable methods (e.g. Edmonds, 2002) and matching (e.g. Clements et al., 2014). However, many barriers to implementing such experimental approaches often exist, including programme resource levels, ethical considerations, non-random allocation of treatment units, lack of available controls, lack of data, among many others (see Ferraro and Pattanayak, 2006). An alternative when these experimental options are not possible is to construct counterfactual scenarios based on target species population histories, threat levels and the socio-economic and management context of the programme just before the intervention commenced to predict the counterfactual outcomes for species in the absence of conservation (e.g. Butchart et al., 2006a).

Given its scalability and objectivity, the RLI has potential to be a useful indicator at an institutional level to help assess organizational conservation impact, inform institutional decision-making, and to provide evidence to donors and other institutional stakeholders of the 'return on their investment'. However, the RLI has not yet been used to track extinction risk in a set of species targeted specifically by an individual conservation agency, or with reference to a counterfactual scenario in this way. Here, we aim to test the feasibility of employing the RLI on a modestly sized set of species as a metric of institutional-level conservation impact, using Durrell Wildlife Conservation Trust as a case study. This international charity focuses on the conservation of globally threatened terrestrial vertebrate species and is characterized by running intensive multi-decadal conservation programmes on a relatively small number of species. We discuss the benefits and limitations of using the RLI for this purpose and examine in what contexts the approach may be effective.

2. Materials and methods

2.1. The institution and species selection

The Durrell Wildlife Conservation Trust (Durrell) is a non-profit organization based in Jersey, Channel Islands, whose mission is 'saving species from extinction'. It runs long-term field programmes targeting globally threatened terrestrial vertebrate species on island ecosystems (www.durrell.org). For example, Durrell has been running programmes in Madagascar for over 25 years and in Mauritius for over 35 years. Over its history, Durrell has led, or supported a national-level partner organization to conduct, species-specific conservation interventions on 53 vertebrate species, including fish ($n = 1$), amphibians ($n = 2$), reptiles ($n = 17$), birds ($n = 16$) and mammals ($n = 17$), for which detailed documentation exists. Durrell has also previously run field-based programmes on approximately 10 other species which are insufficiently documented to consider in this study.