



A decision tool for listing species for protection on different geographic scales and administrative levels



Bertrand Schatz*, Perrine Gauthier, Max Debussche, John D. Thompson

UMR 5175 Centre d'Ecologie Fonctionnelle et Evolutive, CNRS, 1919 route de Mende, 34293 Montpellier cedex 5, France

ARTICLE INFO

Article history:

Received 19 December 2012

Received in revised form 5 September 2013

Accepted 9 September 2013

Keywords:

Conservation priorities
Endemism
Listed species
Orchidaceae
Rarity
Vulnerability

ABSTRACT

An important task in conservation biology is to assess the spatial scale pertinent for species protection since some species may require protection throughout their distribution, others in only part of their range. Once this is done, species can be correctly identified for listing at different administrative levels (e.g. continental, national, and local). Here, we propose an objective method to list taxa at nested administrative levels based on three criteria (responsibility, rarity and vulnerability). We tested the method using quantitative data on the distribution, abundance and decline of orchids in France. The proposed method enables increased protection status in regions where species' abundance and diversity are higher, gives priority to species for which an individual administrative unit has high responsibility and allows objective integration of species decline at different administrative levels. The method also enables the integration of locally rare species at their distribution limits and avoids repetition of species listing across second-level administrative units. The use of an objective method such as this could contribute to a standardised system of priority setting that integrates the geographic scale of rarity in relation to different administrative levels for protection.

© 2013 Published by Elsevier GmbH.

Introduction

Effective conservation requires the establishment of priorities (Bottrill et al. 2008; Margules & Pressey 2000). A key task here is to assess the geographic and administrative levels necessary for priority setting since some species may require protection throughout their distribution (across administrative units), others in only part of their distribution where their populations are highly threatened. Policy for habitat and species protection at different administrative levels thus requires articulation across different geographic scales and administrative levels (Abbitt et al. 2000; Hartley & Kunin 2003; Pfeifer et al. 2010; Schmeller et al. 2008). Indeed, decisions concerning species listing or protected area selection often occur within administrative units that rarely reflect the scales of species' distributions. Articulating priorities across different administrative units thus remains a serious challenge. Two major issues are at stake here and require careful thought for their integration into any methodology for priority setting across administrative units.

The question of assessing priorities at different spatial scales is particularly clear for species in peripheral parts of their range (Abeli et al. 2009; Hartley & Kunin 2003). Listing species for protection that are locally rare but globally common may lack pertinence for conservation planning due to their marginal nature in that region

(Abbitt et al. 2000; Rodrigues & Gaston 2002; Vazquez et al. 2008). Indeed, administrative divisions can have an important influence on conservation recommendations (Erasmus et al. 1999), bias allocation of conservation funding (Hunter & Hutchinson 1994), and reduce cost efficiency (Kark et al. 2009). However, for many plants and invertebrates with restricted dispersal mechanisms, peripheral populations may be important areas of ongoing diversification (Lesica & Allendorf 1995; Pfeifer et al. 2009, 2010; Thompson 2005; Thompson et al. 2010) or represent leading edge populations in the ecological and evolutionary response of species to environmental change (Channell & Lomolino 2000; Gibson et al. 2009). Hence, correctly assessing priorities for the populations of species on the periphery of their range is an important challenge (Abeli et al. 2009; Leppig & White 2006; Millar & Libby 1991).

The second issue that requires attention concerns the need to identify the geographic gradients of climate, geology and human activities that can commonly cause gradients in species diversity and rarity; as has been illustrated for endangered species in North America (Dobson et al. 1997) and for the European Union member states where resource allocation is centred on southern Europe due to the presence of many range limited species of conservation importance (Bladt et al. 2009). It is thus important to have criteria that identify important areas of endemism and rarity and where species are endangered (Gauthier et al. 2010; Pärtel et al. 2005; Schmeller et al. 2008). As recent methodological propositions clearly illustrate (Bacchetta et al. 2012; Gauthier et al. 2013), a critical issue of priority setting here concerns the need to

* Corresponding author. Tel.: +33 4 67 61 33 00; fax: +33 4 67 41 06 16.
E-mail address: bertrand.schatz@cefe.cnrs.fr (B. Schatz).

distinguish naturally rare and endemic species which may often occur in stable habitats from those which currently incur high threats due to the vulnerability of their habitat. It is also of primary importance to adapt the thresholds used for different ranking criteria to the geographic and biological realities of the study area, as [Martín \(2009\)](#) has shown for biodiversity on oceanic islands where endemism (and thus local responsibility) are high and species may most often be scarce (low local abundance). Finally, wherever possible, criteria should enable a taxonomically unbiased process of ranking that does not focalise attention on emblematic species ([Martín et al. 2010](#)).

A standardised method for priority setting which allows for scaling of criteria of rarity and vulnerability across administrative units and levels is now necessary for “the strategic allocation of flexible, but limited resources in global conservation planning” ([Schmeller et al. 2008](#), p. 3625). Databases on patterns of species distribution and abundance are improving rapidly in terms of numbers of groups that are being inventoried and the quality of the data they contain. In future decades such databases will provide sources of information for decision makers to establish priorities in an interactive manner across their respective administrative units. It is thus important to develop methods to articulate priority setting across administrative units that rely on quantitative data to produce objective lists of protected species.

In this study we develop a simple and objective method for priority setting on two different administrative levels based on three criteria to assess the spatial scales of rarity and decline: responsibility; rarity; and, vulnerability. These three criteria have been tested at different spatial scales and administrative levels ([Gauthier et al. 2010, 2013](#)) but their articulation across different scales and administrative levels for a given set of species has not been tested. This paper has three aims. First, we build a decision rule based on the three criteria to establish lists of species for protection on a first order administrative level (in our study this is at the national level) and on a range of different units at a second administrative level (in our study this is done for the 22 administrative regions within France). Second, to test the applicability of the method, we used data bases and information on distribution, abundance and decline for orchid taxa in France and Europe to score species for the three criteria at each administrative level and produce lists at two administrative levels: national listing; and, listing in each region. Third, to assess the pertinence of our method we compared these lists with the current regional and national lists in France, and also the IUCN regional list for France ([IUCN 2010](#)).

Methods

Criteria and administrative context

In this paper we test a method to list species at two administrative levels in France: at the national level; and, within each of the 22 French regional administrative units (including Corsica). In France, a list of nationally protected plant species was established in 1982, and lists of protected species have been produced for each region from 1986 to 2004 ([Danton & Baffray 1995](#)). A national red list has been compiled by [Olivier et al. \(1995\)](#). Regional lists were produced independently, causing much repetition of species on different lists ([Gauthier et al. 2009](#)).

Our study is based on the use of three criteria (responsibility, local rarity and vulnerability) that allow for information and questions concerning rarity to be synthesised on different spatial scales ([Gauthier et al. 2010, 2013](#)). Responsibility provides an assessment of the biogeographic scale of rarity (which species are endemic and which species are widespread), local rarity provides an assessment of abundance within a study unit (national or regional) and

thus accounts for spatial variation in rarity and vulnerability identifies which species show a decline and whether this decline is widespread across regions or localised in particular parts of the distribution of a species.

A decision tool for listing species at two administrative levels

We propose a decision tool to allocate species for listing at either the national or regional level. The decision procedure is first performed using data for all species at the national level ([Table 1a](#)) and subsequently for the species present within each region ([Table 1b](#)). The process depends on scores for each of the three criteria at the national level and in each region where they are present. In the decision tool, scores for responsibility and rarity ranged from one to five (following [Gauthier et al. 2010](#)) and vulnerability was assessed as an observed decline (or not), and we distinguished species which showed a decline in more than two regions from those which showed a decline in only one or two regions. To compare actual lists of protected species with those proposed by the decision tool we distinguished five scores for vulnerability as for the other two criteria ([Table 2](#)).

The decision process works across the columns of [Table 1](#) from left to right in an “if”, “and”, “then” iterative procedure across the table. “If” a species satisfies the three criteria “then” a form of listing is proposed. Going down the table, all the different possible combinations of the three criteria are treated.

For listing species at the national scale ([Table 1a](#)), the procedure we propose gives priority to taxa which are either endemic or sub-endemic to France or show a widespread decline across the study area, whatever their rarity in France. Hence, if a species (sub-) endemic to France is given a score of five for national responsibility then it is proposed for national listing, whatever its rarity or vulnerability (line 1 in [Table 1a](#)). If a species has a score of four for national responsibility then it can be allocated for either national or regional or no listing, depending on its rarity and vulnerability. If the species has a high score for national rarity (4–5) then it will be listed for national protection (line 2 in [Table 1a](#)). For more common species (a score of national rarity of 1–3), or for species with a low national responsibility (1–3) if they show widespread decline then they are proposed for national protection (lines 3 and 7), if they show a localised decline (one or two regions) then they are proposed for regional protection in the regions where a decline is observed (lines 4 and 8), if no decline has been observed then they remain unlisted (line 5). Finally, regional protection is proposed for geographically widespread species (national responsibility of 1–3) that show no decline but only occur in one or two regions ([Table 1a](#) line 6). These species, along with the sub-endemic species proposed in line 2, represent species that occur in France as peripheral populations.

In the analysis of the different regional data sets, proposals for regional protection concern any species that shows a decline in a given region ([Table 1b](#) lines 1–4), and species that do not show a decline in the given region but which are rare in the region or because the region has a high responsibility for such species within France ([Table 1b](#) lines 1–2). For taxa in the classes 3–4 of regional responsibility (line 2), since the classes are based on the percentage of national point occurrences that occur in the region, taxa may occur in more than two regions and thus are not selected in the procedure based on the national data set in which rarity is based on the number of regions. Hence they are not all automatically selected in [Table 1a](#). Hence the analysis based on regional data sets allows us to propose additional species for regional protection that are rare at the national level in terms of abundance and distribution but which are missed in the first step because they occur in more than one other country and in more than two regions in France and show no observed decline. However, the point occurrence data show that they are very rare wherever they occur and the decision process

Download English Version:

<https://daneshyari.com/en/article/4399835>

Download Persian Version:

<https://daneshyari.com/article/4399835>

[Daneshyari.com](https://daneshyari.com)