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ORIGINAL PAPER

Determination of national conservation responsibilities for species conservation in regions with multiple political jurisdictions

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Abstract The Convention on Biodiversity (CBD) commits its signatories to the identification and monitoring of biodiversity. The European Union has implemented this commitment into its legislation. Despite the legal requirement resources are scarce, requiring a prioritization of conservation actions, including e.g. monitoring. Red lists are currently the most prominent tool for priority setting in applied conservation, despite the fact that they were not developed for that purpose. Therefore, it is hardly surprising that they do not always reflect actual conservation needs. As a response, the concept of national responsibility as a complementary tool was developed during the last two decades. The existing methods are country specific and mainly incomparable on an international scale. Here, we present a newly developed method, which is applicable to any taxonomic group,

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adjustable to different geographic scales, with little data requirements and clear categorizations. We apply the new method to over 1,000 species in several countries of different size and report on the applicability of our method and discuss problems that derive from the currently available data. Our method has several major advantages compared to currently available methods. It is applicable to any geographic range, allows automatization, given database availability, and is readily adjustable to future data improvements. It further has comparably low data demands by exploiting one of the most commonly available information on biodiversity, i.e. distribution maps. We believe that our method allows the allocation of the limited resources in nature conservation in the most sensible way, e.g. the sharing of monitoring duties, effectively selecting networks of protected areas, improving knowledge on biodiversity, and closing information gaps in many species groups.

Keywords Species conservation · National responsibility · Europe · Evaluation methods · International importance · Distribution range

Introduction

In applied conservation, red lists are the most commonly used tool for conservation assessment as they explain the complex phenomenon "endangerment" in a simple way (The Nature Conservancy 1988; IUCN 1996, 2001), granting high public acceptance (Schnittler and Günther 1999). Usually, the resulting threat status for a particular species is also taken as a measurement for conservation priorities, even though red lists were not designed for that purpose. However, red lists may at best be a suboptimal tool for setting conservation priorities in a country or region as the threat status does not always reflect actual conservation needs (Gärdenfors 2000, 2001; Mehlman et al. 2004; Eaton et al. 2005). That is especially true from an international point of view, from which it is clearly more desirable to focus national conservation efforts on the near-endemics centred in the respective country (Schnittler and Günther 1999). Ideally, a population viability analysis for the global population would be the best method to set conservation priorities, but this will be impossible for routine assessments of a range of species in the foreseeable future due to limited data availability. As a response, the concept of national responsibility as a complementary tool was developed (Schnittler et al. 1994; Schnittler and Günther 1999; Schnittler 2004).

The assessment of national responsibilities captures the fact that different parts of a species' distribution range contribute differently to the overall survival of a species (e.g. Hanski 1982, 2001; Hanski et al. 1995). Hence, national responsibility assessment covers the notion of importance of a region for the conservation of biodiversity in respect to its irreplaceability (Brooks et al. 2006). The assessment of national responsibilities will allow to focus conservation efforts on populations, which are important for the global survival of a species, and thus will increase the efficiency of biodiversity conservation. International importance as such is included in several methods of conservation prioritization in many countries, e.g. South Africa (Freitag and Jaarsveld 1997), Australia (Coates and Atkins 2001), the United States of America (Beissinger et al. 2000; Carter et al. 2000), and Canada (Couturier 1999), but is particularly well elaborated in Europe. A recent review (Schmeller et al. 2008), however, shows shortcomings of the existing methods, e.g. not allowing for comparisons between countries, being not freely scalable and mixing the concepts of red lists and national responsibilities.

As there is an urgent need of developing a measure and guidance for how to invest the limited financial and human resources in monitoring and conserving biodiversity, we describe a newly developed method for determining national responsibilities in species conservation that is freely scalable, avoids the confounding with red list status, and is comparable among countries. We apply the new method to species in several countries of different size and discuss our results in light of current data availability and future needs of data gathering through biodiversity monitoring.

Improved national responsibility method

The new method to determine national responsibilities comprises three decision steps (Fig. 1). Step one is to select the taxonomic unit. The national responsibility can be assessed on all taxonomic or non-taxonomic units, such as evolutionary significant units (ESUs), given that sufficient data is available. The first decision is necessary to be able to concentrate the conservation effort on distinct units. Consideration whether a taxonomic unit is to be protected in its own right has to be done beforehand to be able to determine the responsibilities of different (political) entities for this unit. For ease of language, in the following we use "species" as synonym of "taxonomic unit" since it is the most commonly used taxonomic unit.

Step two is to determine the distribution pattern of the species: 'local' defines a species with a patchy distribution within one biogeographic region (*sensu* European Habitats Directive (Council Directive 92/43/EEC)), and 'wide' refers to a species distribution spanning more than one biogeographic region. The third category is 'regional', meaning that two-thirds of the distribution area of a species is located in one biogeographic region (for examples see Fig. 2).

Generally, the distribution pattern may serve as an approximation of a species ability to cope with threat factors, as a species' distribution pattern in relation to environmental conditions is a consequence of individuals' decisions (e.g. McIntyre and Wiens 1999; Wiens et al. 1997). Hence, the distribution pattern provides information about migration

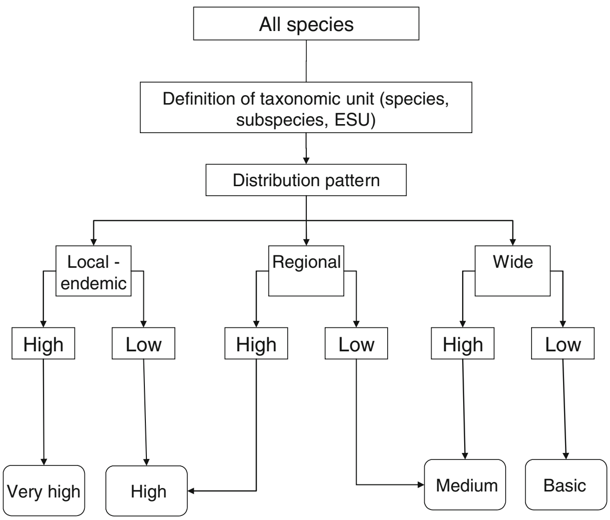
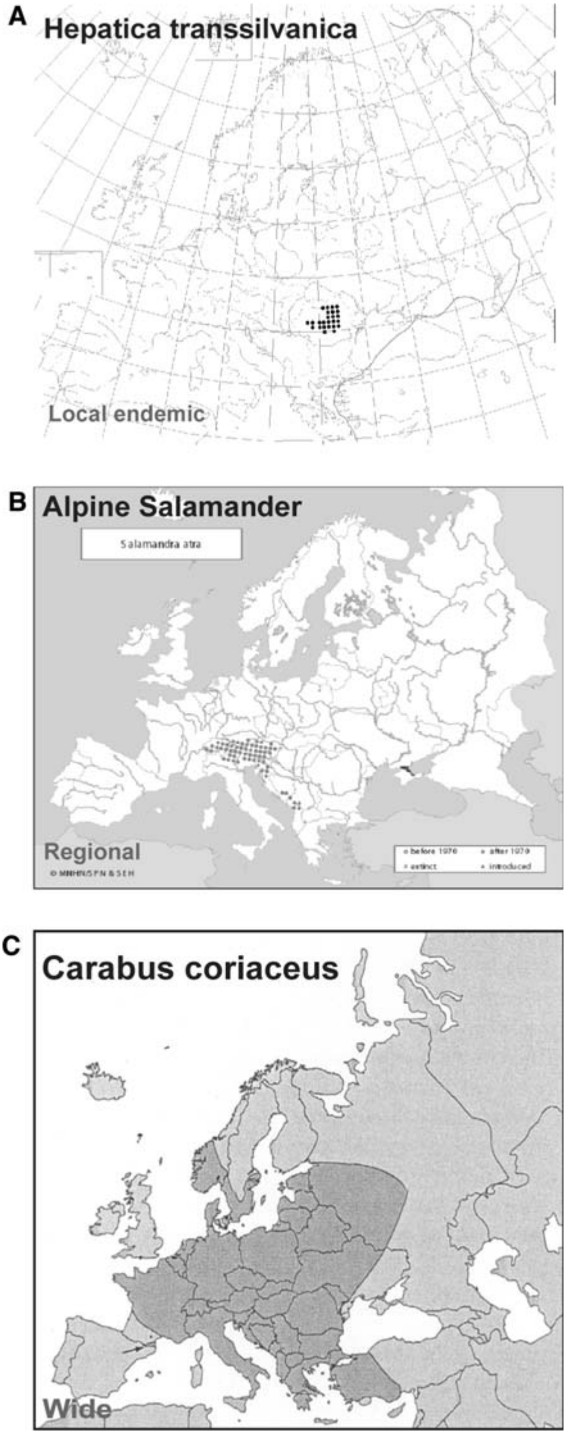


Fig. 1 Decision tree of the newly developed method for the determination of national responsibilities in species conservation in Europe

Fig. 2 Examples for the criterion distribution pattern, showing local—endemic (**a**), regional (**b**), and a wide distribution pattern (**c**). Reproduced from the Atlas Florae Europaeae Database (http://www.fmnh.helsinki.fi/english/botany/afe/publishing/database.htm) for **a**, Gasc et al. (1997; http://www.gli.cas.cz/SEH/atlas/atlas.htm) for **b**, and Turin and Penev (2003) for **c**



options of species, and the degree of isolation between populations. Further, species with wide distributions tend to be locally more abundant than species with narrow distributions (Hanski and Gyllenberg 1997). This relationship was named the distribution-abundance curve and is explained by the fact that generalist species, or species using ubiquitous resources (Hanski 1991), are both locally common and widely distributed, whereas specialists are constrained to have narrow distribution and tend to be locally uncommon according to Brown's hypothesis (Brown 1984). Moreover, distribution is a suitable predictor of the differential extinction proneness of species in the face of habitat loss and fragmentation (Henle et al. 2004).

The final step in our method is the calculation of proportional distribution in the focal area. Here, we follow the suggestion of Keller and Bollmann (2001, 2004) and calculate the expected distribution probability (DP_{exp}) as the ratio of the distribution area of the species in the reference area and the size of the reference area according to Eq. 1. This expected value is compared to the ratio of the distribution range of the species in a focal region to the total size of the focal region (observed distribution probability; DP_{obs}, Eq. 1). If the latter value is twice as high as the expected value, the probability of the occurrence of a species in the focal area is high, otherwise it is classified as low. We followed the rationale that if a species occurs in a country across a

$$\begin{aligned} DP_{\text{exp}} &= \frac{distribution_{\text{reference\_area}}}{reference\_area_{\text{total}}} \\ DP_{\text{obs}} &= \frac{distribution_{\text{focal\_area}}}{focal\_area_{\text{total}}} \end{aligned} \tag{1}$$

larger area than expected based on its European distribution, the living conditions in that country should be particularly suitable for the species. Hence, the loss of populations of that species in that particular area would be a substantial loss for the global population.

National responsibility assessments

In order to test the applicability of the method, we made extensive national responsibility assessments for several species groups in different countries of different size. Altogether we assessed the national responsibility for about 1000 species from Slovenia (354), Hungary (388), Germany (285), and the Baltics with a focus on Lithuania (200). About 50 species were shared between countries (Table 1). In addition, we analysed about 40 subspecies in the genus *Carabus* and in the families Orchidaceae and Ranunculaceae.

To demonstrate the complementarity of the national responsibilities to the red list approach we tested for a relationship between national responsibilities and red list status using a Kruskal–Wallis ANOVA (Procedure NPAR1WAY; SAS Institute, Cary, NC, USA, 1999). For that analysis, we ranked each red list category numerically, starting from the lowest ("basic" in national responsibility, "least concern" in the red list status) to the highest category ("very high"/"extinct in the wild").

Results

The new method led to an assignment of 3% of the total sample to the highest national responsibilities category "very high"; over 50% of the species were assigned to the category

Table 1 Country specific data on the number of species ($N_{species}$), number of endemics ($N_{endemics}$) with most or all of their distribution in the focal country, country size, the number of biogeographic regions (N_{BioReg}) within the country, and main biogeographic region ($BioReg_{dom}$)

Country	$N_{species}$		$N_{endemics}$	Country size	N_{BioReg}	$BioReg_{dom}$
Germany	Reptilia	14	0	357,021 km^2	3	Continental
	Cyprinidae	34	0			
	Odonata	83	1			
	Carabus	27	0			
	Orchidaceae	29	0			
	Ranunculaceae	81	2			
	Amphibia	21	0			
Hungary	Reptila	14	2	93,030 km^2	2	Pannonian
	Cyprinidae	37	1			
	Odonata	63	0			
	Carabus	26	2			
	Orchidaceae	56	2			
	Ranunculaceae	59	0			
	Amphibia	18	1			
Slovenia	Reptila	24	0	20,273 km^2	2	Continental
	Cyprinidae	37	9			
	Odonata	70	0			
	Carabus	37	5			
	Orchidaceae	68	1			
	Ranunculaceae	99	7			
	Amphibia	19	1			
Baltics	Reptila	7	0	175,015 km^2	2	Boreal
	Cyprinidae	25	0			
	Odonata	60	0			
	Carabus	17	0			
	Orchidaceae	40	1			
	Ranunculaceae	80	0			
	Amphibia	13	0			

"basic"; the distribution of the classes follows a Poisson-distribution (Fig. 3). The distribution, however, varies among countries, with Slovenia showing the highest proportion of very high (7%) and high national responsibilities (11%). In Germany and the Baltics, the proportion of both categories combined was only 2% (Fig. 4). Generally, we observed a significant shift toward higher responsibility categories in Hungary ($\chi^2_1 = 27.78$; $\alpha < 0.001$) and Slovenia ($\chi^2_1 = 37.17$; $\alpha < 0.001$) as compared to Germany (Fig. 4).

In the case of species shared between different countries the new approach results in one-category-differences in national responsibilities among countries. The size of a country, however, seems not to be related to the national responsibility category assigned to shared species (Table 2).

We did not detect a significant relationship between the national responsibilities and the conservation status as given in the IUCN Red List ($\chi^2_3 = 3.97$; $\alpha = 0.265$) or national red lists ($\chi^2_5 = 2.24$; $\alpha = 0.814$). Comparing the median of each red list rank in a national

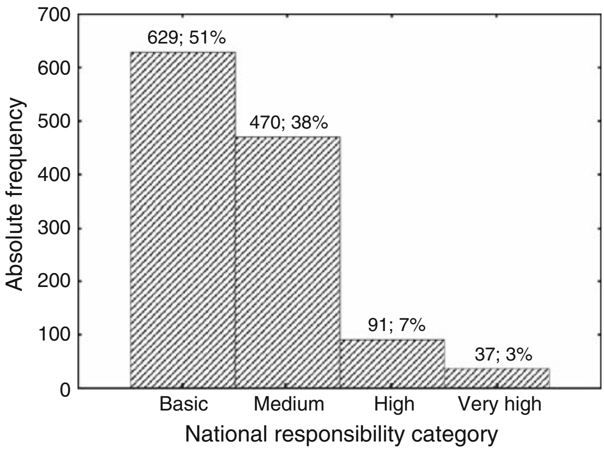


Fig. 3 Overall distribution of national responsibility categories, across countries (HU = Hungary, DE = Germany, SI = Slovenia, Baltics = Estonia, Lithuania, and Latvia) and species groups with the total number and the percentage indicated on top of each bar

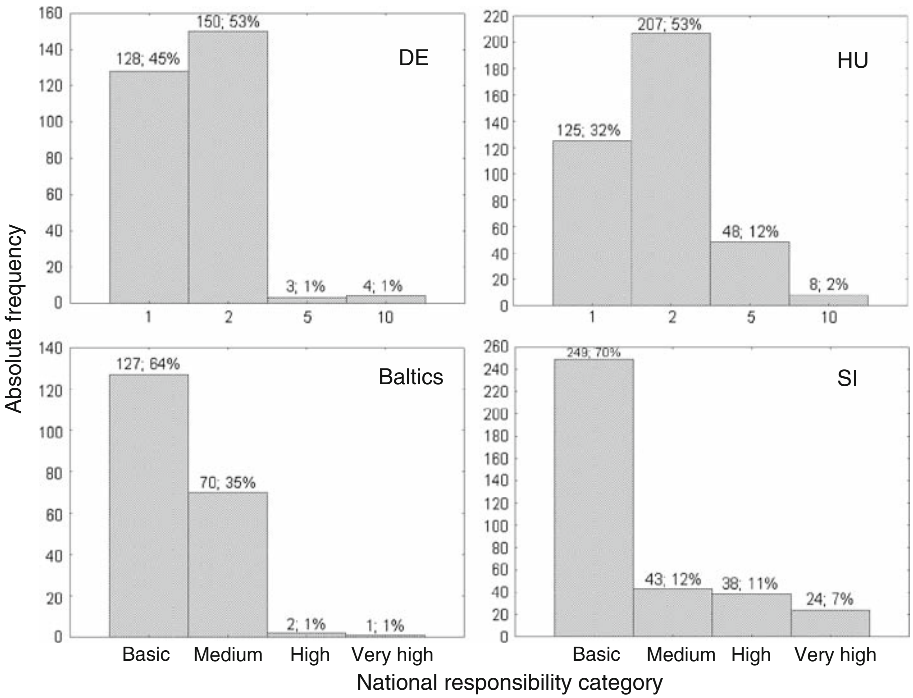


Fig. 4 Distribution of national responsibility categories per country (HU = Hungary, DE = Germany, SI = Slovenia, Baltics = Estonia, Lithuania, and Latvia) and across species groups with the total number and the percentage indicated on top of each bar

responsibility category shows only a trend for the IUCN Red List (Kruskal–Wallis-ANOVA: $\chi^2_3 = 7.10$; $\alpha = 0.069$). On a country level, the Kruskal–Wallis-ANOVA was significant in Slovenia for the IUCN Red List ($\chi^2_3 = 15.087$; $\alpha = 0.002$) and in Hungary for both, national and IUCN Red List (NRL: $\chi^2_3 = 46.851$; $\alpha < 0.001$; IUCN: $\chi^2_3 = 11.124$; $\alpha = 0.011$).

Table 2 List of species spread over a wider distribution area and therefore being shared between different countries

Genus	Species	Country	NR	IUCN	NRL	Species-group
Triturus	*alpestris*	Hungary	Medium	LC	VU	Amphibians
		Slovenia	Basic	LC	VU	
		Germany	Medium	–	–	
Hyla	*arborea*	Slovenia	Basic	NT	VU	
		Germany	Medium	LC	EN	
		Hungary	Medium	LC	LC	
		Baltics	Basic	LC	NT	
Rana	*arvalis*	Slovenia	Basic	LC	VU	
		Germany	Medium	–	EN	
		Hungary	Medium	LC	LC	
		Baltics	Medium	LC	–	
Abramis	*ballerus*	Slovenia	Basic	–	VU	Cyprinids
		Germany	Basic	–	VU	
		Hungary	Medium	–	LC	
Alburnus	*alburnus*	Slovenia	Basic	LC	–	
		Germany	Basic	LC	–	
		Hungary	Basic	LC	LC	
Aeshna	*affinis*	Baltics	Basic	–	–	Odonata
		Slovenia	Basic	–	VU	
		Germany	Basic	–	CR	
		Hungary	Basic	–	LC	
Cordulia	*aenea*	Baltics	Basic	–	–	
		Slovenia	Basic	–	–	
		Germany	Medium	–	EN	
		Hungary	Medium	–	LC	
Limodorum	*abortivum*	Slovenia	Basic	–	EN	Orchids
		Hungary	Medium	–	LC	
Spiranthes	*aestivalis*	Slovenia	Basic	–	VU	
		Hungary	Medium	–	CR	
Epipogium	*aphyllum*	Slovenia	Basic	–	EN	
		Baltics	Basic	–	EN	
		Hungary	Medium	–	VU	
Ophrys	*apifera*	Slovenia	Basic	–	VU	
		Hungary	Medium	–	VU	
Actaea	*spicata*	Baltics	Medium	–	–	Ranunculaceae
		Slovenia	Basic	–	–	
		Baltics	Medium	–	–	
		Germany	Medium	–	–	
		Hungary	Basic	–	LC	
Ranunculus	*aconitifolius*	Slovenia	Medium	–	–	
		Germany	Medium	–	–	

Table 2 continued

Genus	Species	Country	NR	IUCN	NRL	Species-group
Ranunculus	*acris*	Baltics	Basic	–	–	
		Slovenia	Basic	–	–	
		Baltics	Basic	–	–	
		Hungary	Basic	–	LC	
		Germany	Basic	–	–	
Lacerta	*agilis*	Slovenia	Basic	–	EN	Reptiles
		Germany	Medium	–	VU	
		Hungary	Basic	–	LC	
		Baltics	Medium	–	–	
Vipera	*aspis*	Slovenia	Basic	LC	EN	
		Germany	Basic	LC	CR	
Lacerta	*viridis*	Hungary	Medium	LC	LC	
		Germany	Basic	LC	CR	
		Slovenia	Basic	LC	VU	

NR = national responsibilities; IUCN = IUCN Red List; NRL = National Red List

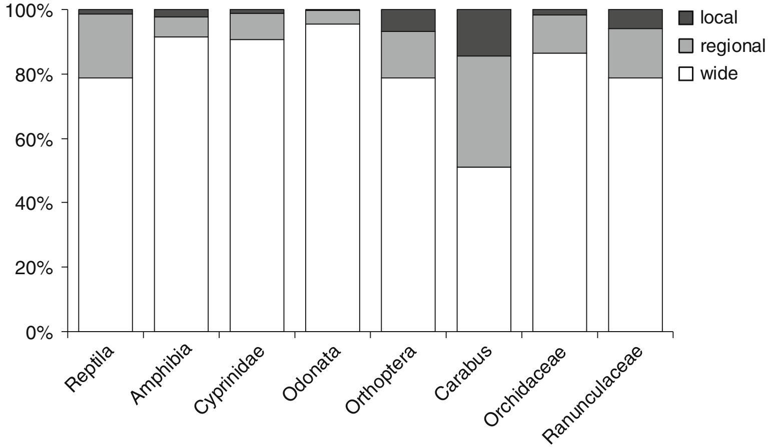


Fig. 5 Proportion of the categories of the distribution pattern (local, regional, wide) in the assessed species groups

The assignment to the categories of the distribution pattern varied among the investigated species groups, differing in the amount of local and regional species (Fig. 5). Hence, also the distribution of national responsibilities differs strongly among the assessed species groups. In *Carabus*, we determined a very high national responsibility for 10% of all species, whereas in most other species groups the proportion was between 2% and 4% (Fig. 6). The different species groups also differ in the coverage in either the IUCN or national red lists. Whereas amphibians and reptiles are well covered, none of the *Carabus* species is listed in the IUCN Red List and even 47 species are not covered by national red lists (Fig. 6).

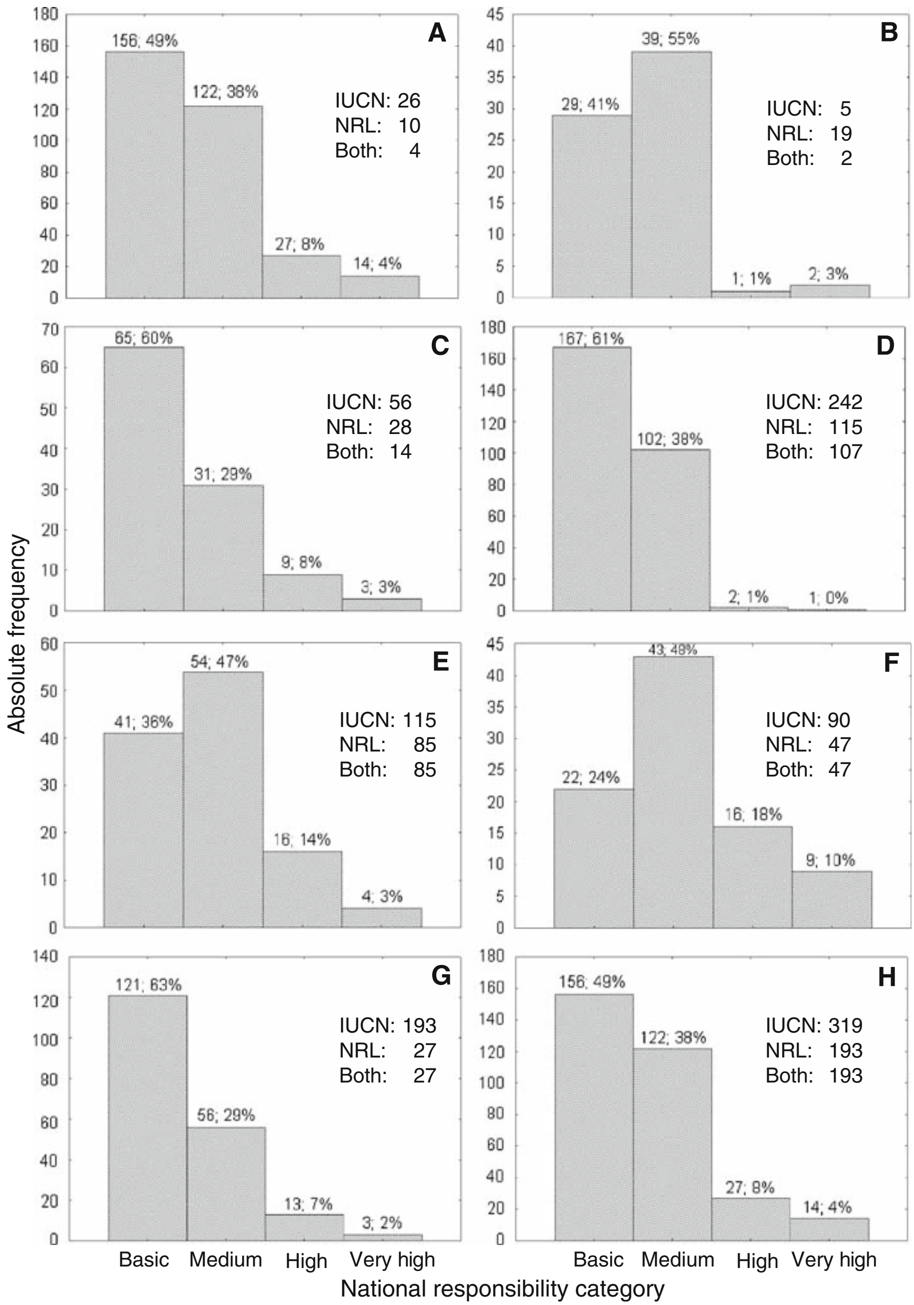


Fig. 6 Distribution of the national responsibility categories by species group, with number of species not covered by the IUCN Red List (IUCN), the national Red Lists (NRL), and both lists (Both). A = Reptila, B = Amphibia, C = Cyprinidae, D = Odonata, E = Orthoptera, F = *Carabus*, G = Ranunculaceae, H = Orchidaceae. The total number and the percentage are indicated on top of each bar

Discussion

National responsibility concepts and conservation priority methods are increasingly developed and applied but usually do not allow comparisons among different countries due to missing standardization (Schmeller et al. 2008) and therefore are not widely accepted (e.g. Fitzpatrick et al. 2007). Here, we present a new method, applicable to different taxonomic groups, adjustable to different geographic scales, with little data requirements, clear categorizations and allowing the development of automatic routines, once a suitable database is created. As such, our method can be used for large-scale assessment of national responsibilities and is highly interesting for parts of the world with multiple political jurisdictions, like state unions, and nations with regional governmental structures. Therefore, we believe our method could become a standard method, allowing to base conservation decisions not only on the conservation status or rarity of a species, but also on the responsibility of a geographic or administrative entity for the survival of a species. Our method is limited by the availability and quality of data, but these requirements are less than for other existing methods and may even trigger the accumulation of more data from so far neglected species groups. In the following, we will discuss the advantages and difficulties of our approach in more detail.

The assessment of species from several species groups in European countries of different size resulted in qualitatively similar distributions of species to national responsibility categories for the compared countries and taxonomic groups indicating the applicability of the new method to different scales and taxa. Only a small proportion of a country's species was assigned to the high or very high responsibility categories (2–18%), which will facilitate allocating national conservation resources to species of high international importance. The missing relationship between the IUCN Red List categories and the national responsibility categories indicates that the two concepts are assessing different aspects of a species and shows that national responsibility is an important additional and widely independent dimension for the conservation of species.

Our approach further considers endemism well, as shown by the shifts towards higher responsibilities with higher degrees of endemism, most clearly visible in the case of the assessed *Carabus* genus. Many of these species have very local or regional distributions (Turin and Penev 2003), leading to higher responsibility classification. With our method, it is also possible to consider ESUs (Moritz 1994), but ESUs are lively debated (Fraser and Bernatchez 2001; Mace and Purvis 2008) and are expensive and difficult to assess in most cases. With our method, we leave the decision whether the data available is sufficient for an assessment of ESU to the user. However, we strongly encourage research on the importance of ESUs and marginal populations for processes creating and maintaining diversity.

We found a geographical component of the assessment of national responsibilities. Slovenia and Hungary had a higher proportion of species in the high and very high responsibility classes than Germany and the Baltics. The shift to higher responsibilities in Slovenia and Hungary very likely resulted from their biogeographic location within European biodiversity hotspots (Hobohm 2003), while the other countries assessed have a much lower amount of endemics (Table 3). The Pannonian region, which is almost fully covered by Hungary alone, is the biogeographic region in Europe with the highest number of endemic invertebrate species (Griffiths et al. 2004, Table 3). Hence, many of these species have a small distribution range, covering only one biogeographic region and the loss of the species in Hungary would mean the extinction of the species on a global scale. Mediterranean countries also have a large amount of endemic species and may therefore receive also a high national responsibility for a higher number of species, as compared to e.g. Germany or the United

Table 3 Number of endemic species in selected species groups per country

	Amphibians	Fishes	Invertebrates	Mammals	Plants	Reptiles	*N*
AT			2		2		4
CY			1	2	17	2	22
CZ					7		7
DE					4		4
EE					1		1
ES	1	3	3		129	5	141
FI			5	2	8		15
FR	1	2			12		15
GR	2	8		1	34	1	46
HU			18		7	1	26
IE			1				1
IT	8	6	4	1	38		57
MT			7		9		16
NL				1			1
PL		1		1	4		6
PT		2	13		118		133
SE					17		17
SI		1	2		7		10
SK					5		5
UK					1		1

The numbers are computed from the current list of Annex II species of the Habitats Directive. For countries, we use the official abbreviations of the European Commission. Countries, which are not listed, do not have endemic species on their territory (e.g. Lithuania, Luxembourg)

Kingdom. National responsibilities, therefore, are not likely to be evenly distributed across Europe, showing the importance of the determination on an international scale to allow reasonable allocation of conservation resources across state unions.

Theoretically, one may expect that the proportional distribution index does not assign conservation responsibilities correctly to small countries or regions, as one may argue that none of the populations are important for the global survival of a species. However, as the proportional distribution in our method is freely scalable, international importance is adjusted to the geographic scale in focus. In that respect, one needs to consider the sensibility of a comparison whatsoever. Comparing large countries such as Russia, China or the USA to smaller countries reduces the precision of our method. The precision of our method is supposedly the highest, when comparing areas of similar size. Moreover, our method considers also the distribution pattern and therewith the potential vulnerability of species, thus assessing the international importance on wider scales as well. Hence, none of the assessed countries or regions will have negligible conservation responsibilities. This is clearly corroborated by the assessment results for the small countries (Baltics and Slovenia). Further, national responsibilities might be the same for a range of countries, their conservation priorities for the species, however, might differ, depending on other factors included in the priority setting (see Schmeller et al., this volume).

Generally, we made an effort to use criteria with clear rationale and created categories with clear and precise definitions, so that not only experts will be able to use the method. We did omit criteria like rarity and distribution center that have been used in previous methods (Schmeller et al., accepted) as their use is limited. Rarity for example has various meanings (Rabinowitz 1981), the importance of the distribution centre relative to the margins of the distribution area is controversial and not all species have a clear distribution centre. For distribution centre even operational definitions are lacking (e.g. Brown 1984; Sagarin et al. 2006).

Despite the low data requirements and clear categorization, data availability may be a problem in the assessment of national responsibilities (see also Schmeller et al. 2008). Whereas birds, amphibians, and reptiles are characterized by a large amount of available data on the global and regional distribution range (e.g. Gasc et al. 1997; Burfield et al. 2004) the synthesized information for plants is considerably less. For example, the published maps in the Atlas Florae Europaeae cover mainly the families Lycopodiaceae to Rosaceae, which include only little more than 20% of the vascular plants of European flora (e.g. Jalas et al. 1999 and are already very dated with the first volume published in 1972. For less well known species groups, such as Lycosidae and Vespidae and many other invertebrates, distribution data is even scarcer and usually not accessible. In these cases, the expected value of proportional distribution cannot be calculated and even our robust method fails. Such species should be marked as data deficient (as in red lists). Countries then have the responsibility to improve knowledge and availability of data, especially if some species of those groups are threatened according to the IUCN Red List or are listed in the Annexes of the Habitats Directive (e.g. *Aspius aspius; Adenophora liliifolia; Rutilus pigus*).

Another difficulty linked to data availability is the scale of the data available. An unbiased determination of the expected value of proportional distribution within a focal area requires that distribution units are studied with comparable methods both in the focal country and in the reference area. This means that (i) species not reported from a certain area are lacking in that area with high probability or at least with equal probability in the reference and the focal area, (ii) units of the focal and the reference areas have the same or similar size or can be converted into each other, and (iii) all units are representatively distributed throughout both the focal and the reference areas. Maps with very detailed presence/absence data (site dots, 10 $\times$10 km squares, $6' \times 10'$ trapezoids) tend to underestimate distribution due to information gaps. In contrast, generalizations toward too large distribution units tend to overestimate real distribution. Therefore, the distribution area should be estimated at the most detailed level available across the reference area. The estimation of the distribution area in the focal area may need generalisation of the available distribution data to larger units (i) to make the units equal to those of the reference area and (ii) to cover the information gaps, unavoidable in the detailed local presence/absence data.

We are aware that the geographic distribution of species is determined by a large number of processes on multiple scales (Maurer and Taper 2002). Thus, areas with a high abundance of a species are small and rare, which results in parts of a species distribution range being more important for conservation than others (Rodriguez 2002). Our approximation of abundance with proportional distribution may therefore not be a valid assumption in some species, due to variations in density, habitat quality, and movement patterns. However, the distribution-abundance curve (Brown 1984; Hanski and Gyllenberg 1997) suggests a general pattern with more widely distributed species being also more abundant locally than local and regionally distributed species. Hence, the number of species for which our approximation may not be valid may be negligible and a special consideration of such species in our method was not implemented to keep the method generally applicable. If the real conservation responsibilities in a certain area might not be assessed adequately, the use of abundance data instead of proportional distribution would be the sole solution. For the rare cases, in which abundance data are available across the range of a species, our method can be easily applied by exchanging distribution for abundance in Eq. 1. Such data would allow more easily assessing the relative importance of distribution centers versus range margins of species. It would partly open up the metapopulation level approach (Hanski 1994) to national responsibility assessment.

A further difficulty for the assessment of national responsibilities with our method arises from the definition of biogeographic regions. Since the number of biogeographic regions in which a species is present, is a criterion for classification of its distribution pattern, the definition of biogeographic region must be precise. The biogeographical regions as used by the Habitats Directive and the Berne Convention for its Emerald Network are a result of simplifying maps of potential natural vegetation to create a map more convenient from an administrative point of view (Roekaerts 2002). For implementation reasons, we follow the latest definition of the biogeographic regions (http://dataservice.eea.europa.eu/atlas/viewdata/viewpub.asp?id=2671), even so they do not fully correspond to the real floral distribution defining a biogeographic region. We stress that the increase of the number of biogeographic regions covered by a species distribution may inadequately decrease the national responsibility for the species in all countries where it is present. To counteract such problems, we decided to implement the cut-off value of two-thirds in a region for the definition of the regional category, more likely reflecting the real biological situation. Another solution could be the use of maps, such as the Environmental Classification of Europe (Metzger et al. 2005), which are not adjusted to political or administrative boundaries. Our method is readily adjustable to the usage of other maps. However, while there is a general consensus on the biogeographic region map, other maps may not be readily accepted by decision makers in conservation, making an implementation less attractive.

Conclusions

Our method has several major advantages compared to currently available methods. It is applicable to any geographic range, allows automatization, given database availability, and is readily adjustable to future data improvements. We did not try to develop a method overly complex, as suggested earlier (Miller et al. 2007), but rather focused on a methodology readily applicable and comprehensible by decision makers. The applicability outside of Europe needs assessments, as data availability might differ and reference areas may be more difficult to identify. However, we believe that our method could become an important international conservation and policy tool, applicable to a wide range of different political and conservational situation across the globe. It will allow the allocation of the limited resources in nature conservation in the most sensible way and it will allow sharing monitoring duties, improving knowledge on biodiversity, and closing information gaps in many species groups to improve national and international conservation actions.

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