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1 Draft methodology for assessing national responsibilities

Deliverable 10 of Work package 4

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1.1 Content

1.2 Executive Summary

This document describes and reviews methods currently used to determine national responsibilities in preserving biological diversity. The analysis of national responsibilities is likely to contribute significantly to fulfilling the objectives of the Convention on Biological Diversity. Beyond providing a review of the conservation status of species using red books and other sources, the analysis of national responsibilities determines the importance of national and regional distributions of species in a global context. Thus, determining the national responsibilities for countries provides a valuable tool for use in legislative and other decision-making processes at both the national and regional level.

We shortly describe the different methods currently used to determine national responsibilities. Even though the document aims to review methods used worldwide, it mostly uses examples from European countries, but also mentions approaches used in Canada and Australia. Approaches in these countries may encounter similar problems regarding state- or province-level responsibilities as the European Union. This paper will be used as a basic document in discussions in Work Package 4 of the EuMon project on the advantages/disadvantages of different methods and potential ways to incorporate the methods or parts of them into a “best practice” method. The potential utilization and application of each method based on currently available data will also be considered.

A special problem in determining national responsibilities is the question of peripheral populations, which will need further attention because a clear definition appears difficult. In addition, the terminology for the different categories of responsibility should be harmonized between the different approaches and should be improved in a unified framework. Currently two main types of approaches exist in Europe for using information about the distribution of species in the focal area relative to their total distribution for setting priorities, the SPEC system and the concept of national responsibilities.

All methods reviewed here lack a clear conceptual structure and mix conservation status and national responsibility. Further, some of the criteria are arbitrary and not intuitively understandable by lay people and policymakers, and therefore will be difficult to apply. We conclude that there is an urgent need to develop a sound method to determine national responsibilities to facilitate the allocation of conservation tasks to geographical entities, like nations and regions.

1.3 Introduction

At the World Summit for Sustainable Development in 2002 (WSSD in Johannesburg) world leaders agreed on a comprehensive strategy for sustainable development and to reduce the loss of global biodiversity. One year before in 2001 the member states of the European Union accepted an even more ambitious commitment at the EU-summit in Gothenburg: to halt the loss of Europe's biodiversity by 2010. Nations share the responsibility to ensure the survival of as many species as possible on a global level. Limitations in financial and human resources require prudent priority setting to ensure the global survival of as many species as possible.

Without doubt, Red Lists are the most prominent tool for priority setting in applied conservation. However, the responsibility for a species can be high in a country where this species is endemic, but such a species might not necessarily be a threatened species, following Red List criteria. Hence, the threat status is not always reflecting actual conservation needs and can be very different from conservation priorities (Gärdenfors 2000, 2001). As a response to limitations of Red List systems for conservation prioritization, the concept of national responsibility as a complementary tool to the Red List systems was developed over two decades ago (e.g. Schnittler 2004; Schnittler et al. 1994).

National responsibility can be thought of as a measurement directly correlated with the effect of the loss of a population in the area of a political entity on the species' global survival. In other words, if the loss of populations of a species in the focal nation affects its survival particularly strongly, the responsibility of a nation for that species is high. Similarly, if the species is not affected by the loss of a population in the focal nation, the responsibility for the species of that nation is low, which can be also the case, even if the species is globally considered "Endangered". Methods to identify national responsibility try to capture these concepts. They lead to an area-specific prioritization list for species and facilitate decisions on conservation efforts, e.g. to focus the limited financial budgets on the species and populations in most need of protection in the different areas of their range (Schnittler 2004). Such methods are of particular interest in large countries and unions of many members with shared responsibilities for conservation, in which responsibilities are allocated differentially to different regions or member states. The availability of suitable methods for identifying national responsibilities allows conservation decisions to be based not only on the conservation status of a species (Red Lists), but also on the responsibility of a geographic or administrative entity for the survival of a species.

Here we will review currently available methods determining conservation priorities using methods based on concepts of national/regional responsibility. We highlight research needs to increase the usability of the methods at different geographical scales to meet the needs of state unions to implement conservation measures with subsidiary principles. We will give an overview of the differences between the methods and compare their ability to separate the concepts of threat status and national responsibility.

1.3.1 The SPEC systems

The first European-wide introduced conservation priority system that included a concept of the importance of a reference area for the conservation of (bird) species, is the concept of Species of European Concern (SPEC), developed under the umbrella of BirdLife International (Tucker et al. 1994; Fig. 1). That system considers two factors,

(i) the species' European distribution in relation to its global distribution (international importance), and (ii) the conservation status in Europe, which is given by the European Threat Status (IUCN 2001). The SPEC system for birds results in four SPEC categories, with SPEC 1 comprising all bird species globally endangered (IUCN categories: CR, EN, VU), being dependent on conservation or with deficient data. SPEC 2 and SPEC 3 comprise all bird species which have an unfavorable state of conservation in Europe or with unknown status. These two categories are differentiated on the proportion of the European to the global population (Fig. 1).

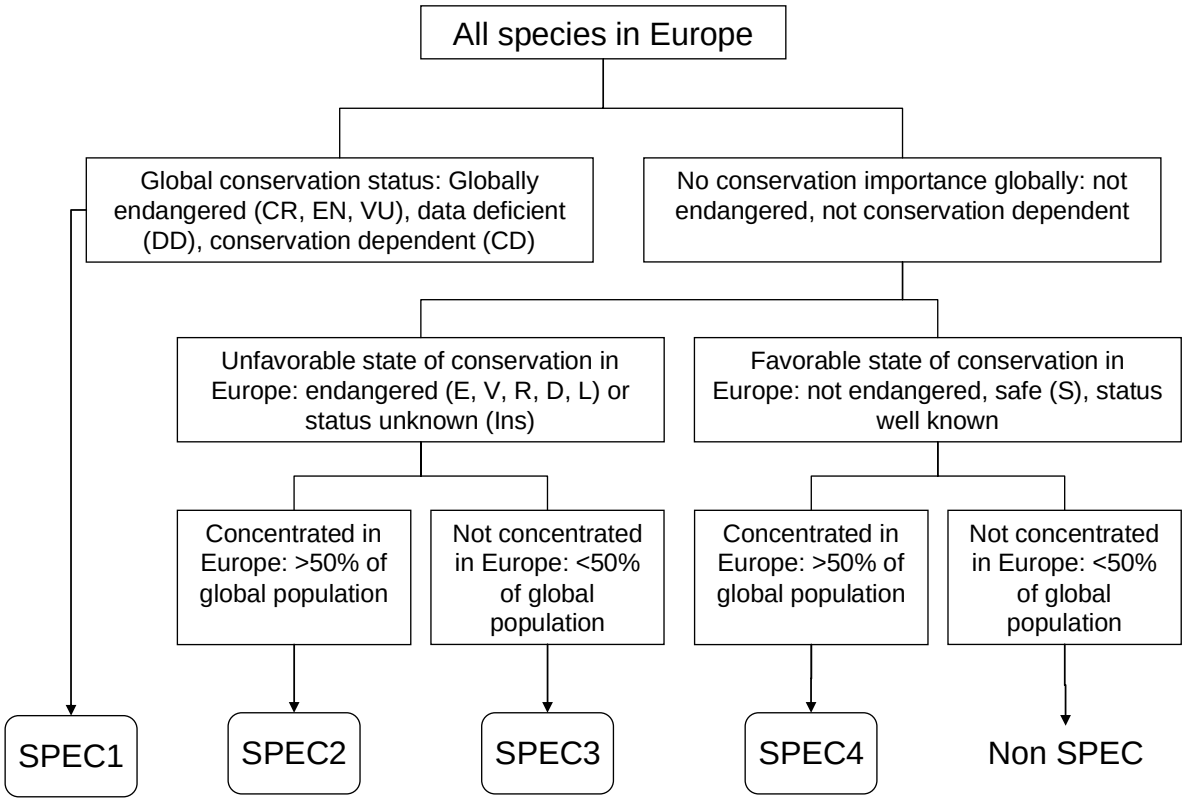

Figure 1: The SPEC system for birds developed under the umbrella of Birdlife International (Tucker et al. 1994). SPEC 1 = birds of global conservation concern; SPEC 2 = species with an unfavorable European conservation status and with more than half of the global breeding or wintering population concentrated in Europe; SPEC 3 = species with an unfavorable European conservation status but with less than half of the global breeding or wintering population concentrated in Europe; SPEC 4 = species with a favorable conservation state and >50% of the global population in Europe. Non-SPEC = species with a favorable European conservation status and with less than half of the breeding or wintering population concentrated in Europe.

Van Swaay and Warren (1999) picked up the idea of the SPEC system and modified it for application on butterfly data (Fig. 2). In contrast to the earlier SPEC system for birds (Tucker et al. 1994), they started with area distribution criterion, which led to a change in the kind of species that are included in the different SPEC categories. SPEC 1 in this system comprises only species which are endemic for Europe and globally endangered. Van Swaay and Warren (1999) further divided the SPEC category 4 into 4a and 4b, where 4a includes European endemics, which are globally not endangered (Fig. 2).

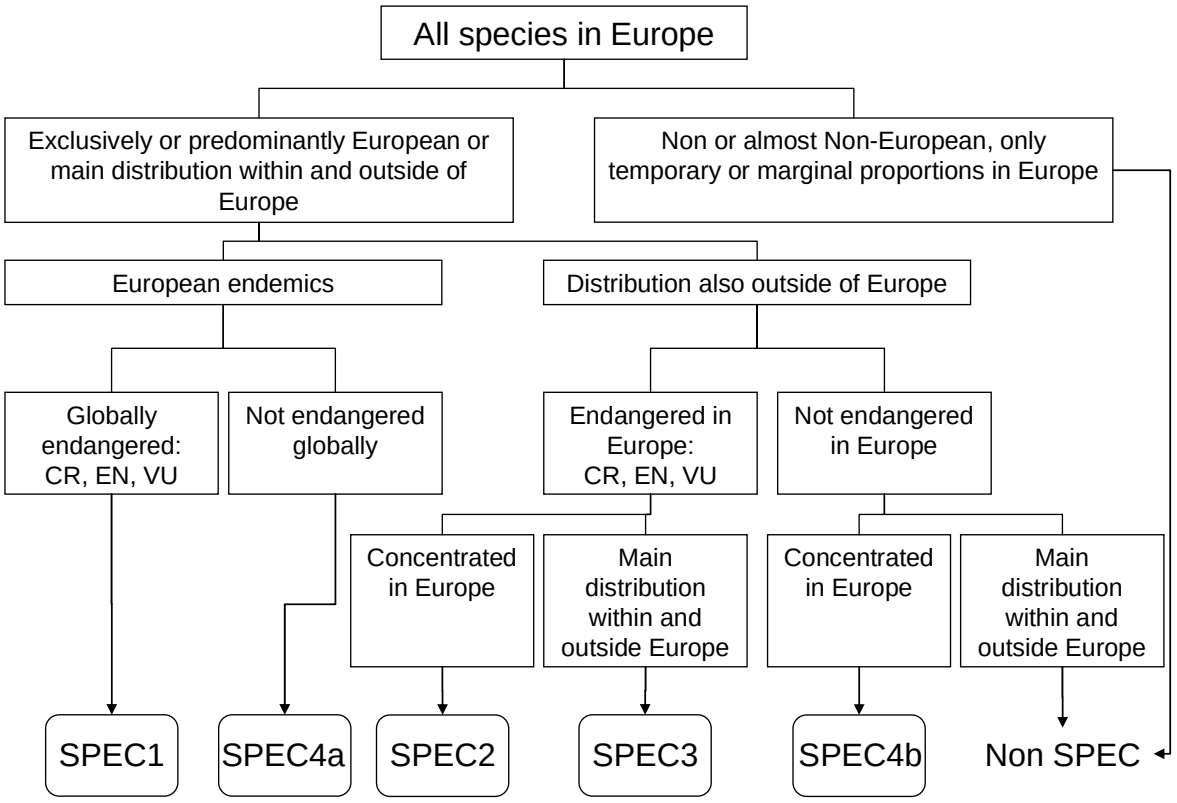

Figure 2: The SPEC system for butterfly species (van Swaay and Warren 1999). SPEC 1 = Species of global conservation concern, because they are restricted to Europe and considered globally threatened; SPEC 2 = Species whose global distribution is concentrated in Europe and are considered threatened in Europe; SPEC 3 = Species whose global distribution is not concentrated in Europe, but are considered threatened in Europe; SPEC 4a = Species whose global distribution is restricted to Europe, but are not considered threatened globally or in Europe; SPEC 4b = Species whose global distribution is concentrated in Europe, but are not considered threatened in Europe.

1.3.2 The national responsibility concepts

The national responsibility concepts can be divided in Conservation cube methods, which use three different axes to assess national responsibility and equally considering different criteria (Avery et al. 1995; Keller & Bollmann 2001, 2004; Figs. 3 & 4), biogeographical methods (Gruttke et al. 2004; Steinicke et al. 2002; Varga et al. 2004, unpublished), focusing on special biogeographical aspects (Figs. 5 & 6), and rank methods (National Recovery Working Group Canada 2005, unpublished, Fig. 7), which give scores within several criteria and derive a total rank for conservation prioritization.

The first Conservation Cube method was developed to prioritize bird conservation efforts in Great Britain (Avery et al. 1995). The method considers national and international conservation status, and international importance. International importance is defined as the proportion of the focal population to the global population. Within each of the axes the three priority classes low, medium, and high were defined. As a result of that method, species are assigned to a red, amber, or green list, roughly corresponding to SPEC 1, SPEC2/3, and SPEC4 (Fig. 3a). The

method was slightly changed for butterflies (Warren et al. 1997) by modifying the decline criteria and by using different importance thresholds (Fig 3b).

A

	HIGH	MEDIUM	LOW
National conservation status	> 50% decline	25-50% decline	other
	OR	OR	OR
International importance	30%	> 15%	< 15%
	OR	OR	OR
International threat	Globally threatened (SPEC 1)	Unfavourable status in Europe (SPEC 2 / 3)	Favourable status in Europe (SPEC 4 or non-SPEC)
	↓	↓	↓
	Red List	Amber List	Green List

Warren et al. 1997

B

	HIGH	MEDIUM	LOW
National conservation status	> 32% loss of 10km grid squares over 25 years	16-32% loss of 10km grid squares over 25 years	other
	OR	OR	OR
International importance	---	>20%	<20%
	OR	OR	OR
International threat	Globally threatened (SPEC 1)	Unfavourable status in Europe (SPEC 2 / 3)	Favourable status in Europe (SPEC 4 or non-SPEC)
	↓	↓	↓
	Red List	Amber List	Green List

Figure 3: Conservation cube methods; a) for bird (Avery et al. 1995) and b) for butterflies (Warren et al. 1997). International importance is assessed on the basis of the percentage of the global distribution represented by the focal area. As a result of that method, species are assigned to a red, amber, or green list corresponding to high, medium and low conservation priority.

Recently, another Conservation cube method was developed to assess the national responsibility for bird species of Switzerland (Keller & Bollmann 2001, 2004, Fig. 4). The three axes are defined by (i) the national conservation status, (ii) the international importance (proportion of the focal population to the global population), and (iii) the status of rarity. In contrast to the earlier method (Avery et al. 1995), only two priority classes - low and high - are used for each axis. The most interesting aspect of this method is the way to define international importance. It was proposed to calculate an expected value of species abundance, based on the proportion of the focal population area to a reference area, which needs to be clearly defined. Is the observed species abundance lower than twice the expected value, the international importance is low and vice versa. Another original factor considered is the rarity status, which has no reflection in the IUCN-categories. They define rare species as those species, which have a high probability of never having been more than 50 breeding pairs during the 19th and 20th century as judged by expert opinion. All remaining species are considered frequent. The method results in five responsibility classes for breeding birds and two additional classes for migratory birds (Fig. 4).

Keller and Bollmann 2004

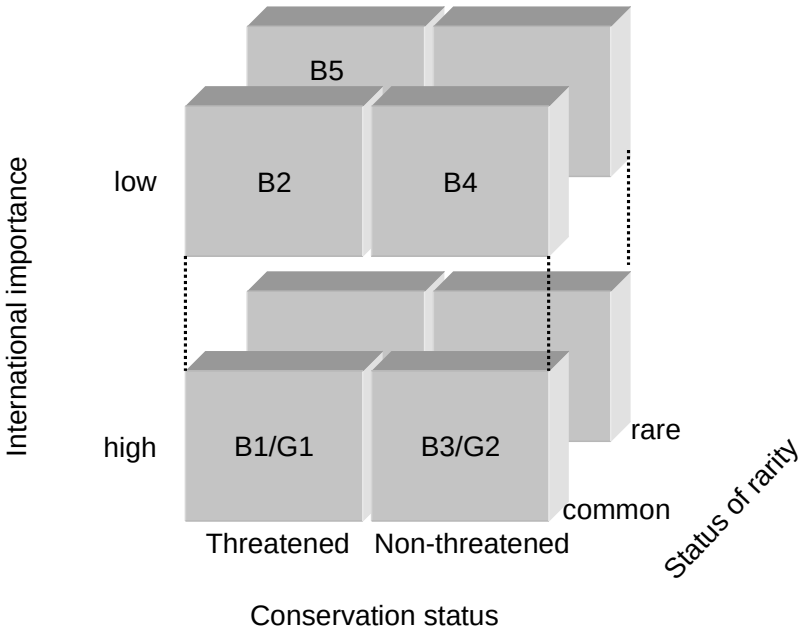

Figure 4: National responsibility methods of Switzerland for bird species (Keller and Bollmann 2004). B1 = Endangered species in Switzerland with high international importance; B2 = Endangered species in Switzerland with low international importance; B3 = Non-endangered species in Switzerland with high international importance; B4 = Non-endangered species in Switzerland with low international importance; B5 = Species, which were never frequent in Switzerland and with low international importance; G1 = Endangered migratory species in Europe with a high international importance; G2 = Non-endangered migratory species in Europe with a high international importance.

A second group of methods for defining national responsibilities considers more explicitly biogeographical aspects (Gruttke et al. 2004; Steinicke et al. 2002, Fig. 5; Varga et al. 2004, unpublished, Fig. 6). These methods follow a decision tree starting with the evaluation of the international importance and the global conservation status. Both methods consider the proportion of a focal population to the global population. While the method of Varga et al. (2004, unpublished) focuses on the biogeographic importance of a species as a measure of international importance, the method of Gruttke et al. (2004) calculates the proportion of the global population/distribution area that falls within the focal area and uses the distribution center as an additional criterion. The two methods differ in their consideration of the population development. In contrast to the cube and SPEC methods, both approaches consider isolated outposts, defined as populations, which fulfill the criteria for an evolutionary significant unit, such as reproductive isolation or significant ecological, morphological, and genetic differentiation (Moritz 1994).

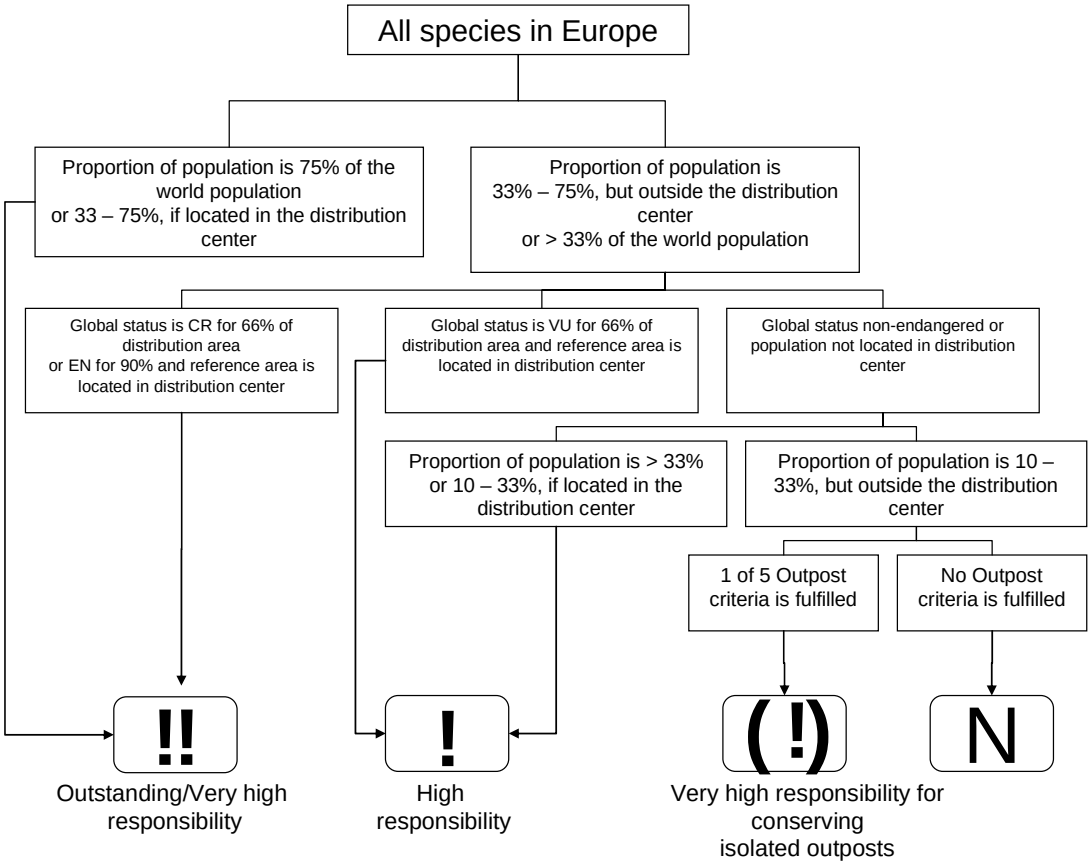

Figure 5: The responsibility method currently introduced to Germany (Gruttke et al. 2004). Very high / Outstanding responsibility (marked as "!!") = The extinction of the focal species in the reference area would drastically diminish the worldwide occurrence and may lead to global extinction; High responsibility (marked as "!") = The local extinction of the focal species would drastically diminish the worldwide occurrence or increase the risk of extinction considerably; Very high responsibility for the conservation of isolated outposts (marked as "(!!)") = In cases where the first two categories "!!" and "!" do not apply, the third category has to be used, if at least one relic population occurs in the reference area or the focal species occurs in an isolated (disjunct) partial area of smaller size. All isolated outposts have to be localized and assessed separately for the following: (i) the outpost population is permanently isolated from the main distribution area and long-distance dispersal appears unlikely to connect the outpost with populations of the main distribution area, and (ii) it fulfills criteria of evolutionary significant units (Moritz 1994).

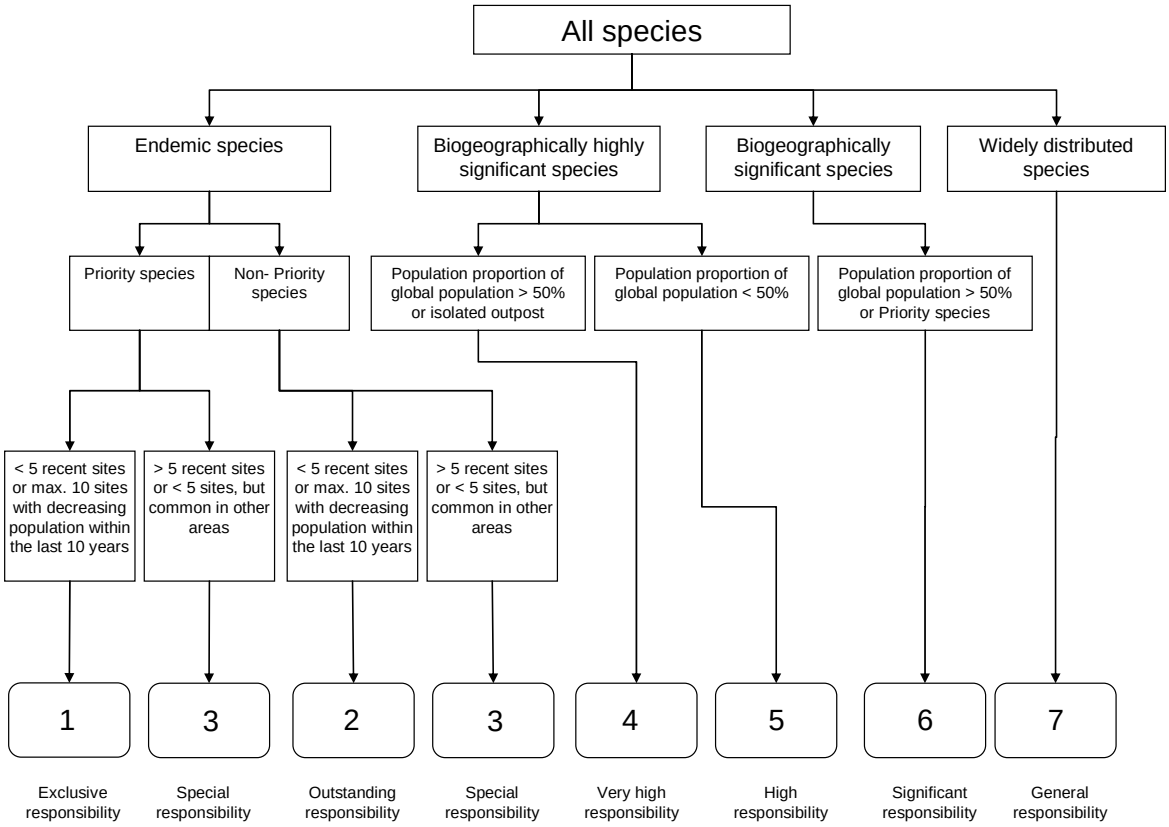

Figure 6: National responsibility method used in Hungary (Varga et al. 2004, unpublished). Exclusive responsibility (1) = Species endemic to the focal region and listed as Priority Species in Annex II of the Habitat Directive, with less than five sites confirmed by recent data or less than 10 sites but with significantly decreasing population size within the last 10 years; Outstanding responsibility (2) = Species endemic to the biogeographic region with less than five sites confirmed by recent data or less than 10 sites but with significantly decreasing population size within the last 10 years; Special responsibility (3) = Species endemic to the biogeographic region, occurring in more than five sites in the focal area or occurring locally also outside of the focal area, but with less than five sites in the focal area confirmed by recent data; Very high responsibility (4) = Species of high biogeographic importance, very restricted or representing a threatened outpost of a more widely distributed species; High responsibility (5) = Species of high biogeographic importance, but not very restricted; Significant responsibility (6) = Species of moderate biogeographical significance with a wide distribution; General responsibility (7) = Widely distributed.

1.3.3 The Canadian Species Priority Ranking system

The National Recovery Working Group in Canada has developed a ranking system with an extensive consideration of different aspects (National Recovery Working Group Canada, 2005, unpublished, Fig. 7). The purpose of the system is to provide a consistent ranking of the relative importance of species at risk (SAR) from a biological perspective and is applied only to such species. The designation of SAR is done by the COSEWIC (Committee on the Status of Endangered Wildlife in Canada). The method has four main criteria, the COSEWIC status (= Red List/Threat status), the designated taxonomic unit at risk, the global range (= international importance), and the relation of the global and regional conservation status (= international vs. national Red Lists). The international importance is subdivided in 6 classes and weighted equally to the threat status (COSEWIC). Also the other criteria are subdivided into several classes with different scores from which a total rank is calculated (Fig. 7). An interesting aspect of this method is the consideration of the taxonomic rank of an endangered

population: if the latter is the only representative of a higher taxon (genus, family, etc,) in the national biota, it is scored higher.

National Recovery Working Group, Canada, 2005, unpublished

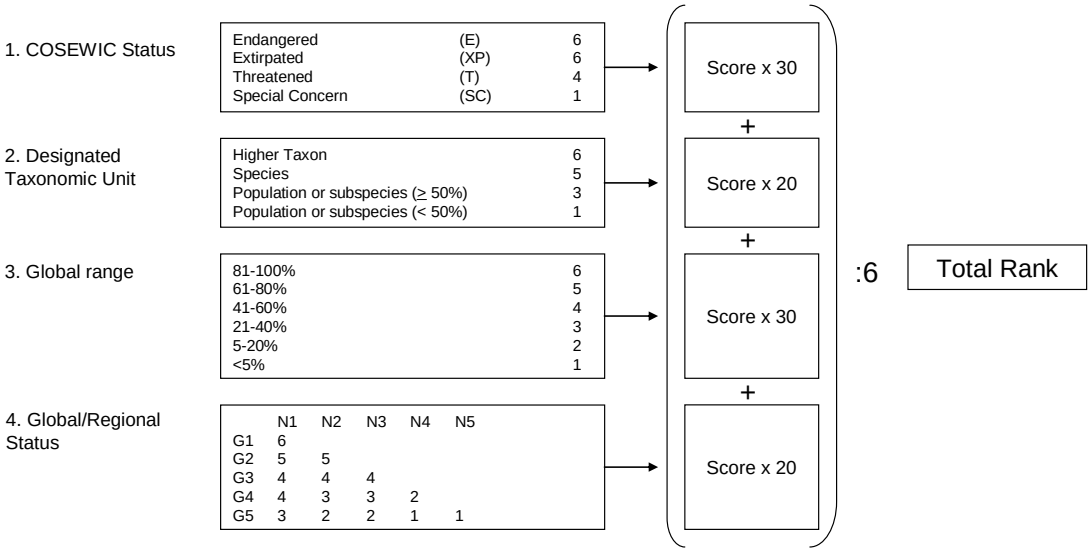

Figure 7: Canadian species priority ranking (National Recovery Working Group Canada 2005, unpublished). In criterion 1 "National conservation status" species at greatest risk in Canada (endangered and extirpated) score highest, whereas "extirpated" scores higher than "Threatened" because the risk of extinction is greater since extirpated species are not being recovered if recovery is not deemed to be biologically and technically feasible. The second criterion "Taxonomic unit designated" reflects the contribution to biodiversity of the unit designated by the national conservation status. If the populations and subspecies considered by COSEWIC comprise 50% or more of the species total range in the focal area they are assigned to the class "Population or subspecies (≥ 50%)". In case the range is less than 50% the class "Population or subspecies (< 50%)" is applied. The third criterion "Percent of the species global range in the focal area" reflects the national responsibility for the conservation of the species. The last criterion "Global and regional status" is based on the Nature Conservancy Rank Data, globally and for adjacent regions. For regional status the US N-rank (national) or NT-rank (subspecies) will be the most commonly used.

The classifications lead to five conservation ranks with rank 1 having the highest conservation priority:

- Rank 1 - endangered or threatened species with moderate to high scores on all criteria
- Rank 2 - extirpated or endangered species throughout Canada, with low score on either the range in Canada or the global/regional status; or threatened species with moderate to low score on at least one other criteria; or endemic species of special concern
- Rank 3 - extirpated or endangered populations, where less than 50% of the species range in Canada is designated, but the species has a large distribution area and its threat status is vulnerable to non-threatened outside of Canada; or threatened species with moderate to low scores on two other criteria; or species of special concern with moderate to high score on at least two criteria
- Rank 4 - extirpated or endangered populations where less than 50% of the species range in Canada is designated, but widespread and vulnerable to non-

threatened globally; or threatened populations or subspecies with a small percentage of their range in Canada; or species of special concern scoring low on 1 or 2 other criteria

- Rank 5 - extirpated or endangered species, with recovery deemed infeasible; or threatened species, only small population designated, and ranked either non-threatened or uncommon globally and regionally; or species of special concern scoring low on at least 2 of the other criteria

1.4 National responsibilities in the different approaches

The approaches reviewed here have in common that they take into consideration biogeographical information in addition to national threat status and international importance, and that they set conservation priorities on a broader geographical, if not a global scale. However, they separate the concepts of national responsibility and threat status to a different degree and they also differ in other aspects (Table 1).

Conceptually, national responsibility serves as a proxy for measuring the probability of global survival for a given species, when the population of the focal area is lost. Therefore, national responsibility describes how the responsibility is allocated to areas (nations or regions). Thus, the national responsibility should not include the Red List status in the determination of the level of responsibility but instead should clearly distinguish between these two types of independent information. The advantage of separating these two types of information is that it allows reflection on the real situation in a more differentiated way. For example, a highly threatened species can occur with some single individuals in a certain country, undertaking a high effort for preservation of the species in that country, but due to the low number of individuals the country is not responsible for the global survival of the species at all (e.g. the great bustard *Otis tarda* in Germany). On the contrary, a common non-threatened species can occur mainly in one country and therefore the responsibility in this country for the species is very high (e.g. alpine newt – *Triturus alpestris* in Germany; Steinicke et al. 2002). None of the reviewed approaches makes this clear distinction between Red List status and national responsibility. This may lead to a non-optimal setting of conservation goals in certain areas.

The different approaches assess national responsibility / international importance in several ways. All use a simple proportion of a focal population to the world population as a criterion, but they differ in the number of classes built. More importantly, the weight given to the relative importance of the focal to the global population in the assessments differs among the methods: by starting with an area (or distribution) criterion and also using area criteria more frequently throughout the assessment steps, the importance of the conservation status is less pronounced in the SPEC system for butterflies (van Swaay and Warren 1999) than in the method for birds (Avery et al. 1995). The second way to include national responsibility is by the determination of the biogeographic relevance of the population (Gruttke et al. 2004; Steinicke et al. 2002; Varga et al. 2004, unpublished) combined with the proportion of the world population in the focal area. A criterion for relative population size is used in the Swiss approach as a third possibility. Such a method is appealing as it can be transferred to different geographic scales, allowing the determination of responsibility on a regional, national, supra-national, and global scale.

The major difficulty in all of the different approaches is the lack of explicit cut-off points or the usage of arbitrary cut-off values for the proportion of a focal to the

global population. Thus, the application of some methods requires expert knowledge largely influenced by subjective components, e.g. where is the limit between “biogeographically highly significant” and “biogeographically significant”? Hence, the methods currently do not allow a consistent assessment by different people, and criteria for an unequivocal distinction between the classes need to be developed. Secondly, most intuitive thresholds are arbitrary and cannot be easily generalized to other nations or scales (e.g. the 33% of the global distribution criterion in the German system). For such generalizations, the use of expected proportional values, such as in the Swiss approach, are more amenable.

Conceptually, the Canadian Species Priority Ranking system is the most clear of all methods, as it clearly distinguishes between national responsibility and conservation status. Such an approach is advantageous, because of the large differences in data availability. For instance, developing the IUCN Red List demands a large amount of data and not all of the information might be easy to collect (de Grammont & Cuaron 2006, Lamoreux et al. 2003). Furthermore, a recent review of threatened species categorization systems on the American continent (de Grammont & Cuaron 2006) showed that only a few Red Lists adequately represent the threat status of species. A clear separation, therefore, would make it possible to incorporate changes in the Red List system used. This is also true for the determination of national responsibilities, as here the basic data vary greatly between and among species groups, too.

Especially, the SPEC methods mix different levels of threat status and national responsibility. The SPEC system for butterflies (van Swaay and Warren 1999) first determines the importance of Europe by separating European species from non-European ones, then determines their conservation status in Europe, and returns to the importance of Europe for the survival of the species by separating species concentrated in Europe from those which have a distribution also outside of Europe. Similarly, the method from Gruttke et al. (2004) mixes conservation status and international importance. The Hungarian System (Varga et al. 2004, unpublished) further enters priority settings derived from the Annex II of the European Union Habitat Directive and parallels these with population proportion and biogeographic importance. The conservation cube methods separate national responsibility from the threat status, but take only a geographical or distribution component into consideration when assessing national responsibility.

National responsibilities, therefore, are not clearly defined or adequately considered in each of the methods. The “best practice” method should be based on the simplest approach, which can be extended where judged necessary, e.g. by emphasising the endemic status of species, the abundance of a species, or migration behaviour. In our opinion, a “best practice” system for Europe should have the following requirements, (i) it should be universal, i.e., easily adaptable for most taxa targeted by conservation actions, (ii) it should contain clear definitions of a few categories based on quantitative or readily quantifiable terms, (iii) the size of the focal area (not necessarily an entire country, but also biogeographic regions) should be considered, (iv) the data requirements should be minimal for efficient classification by usage of easily available information sources and should relate to the previous international systems (preferably the international IUCN Red List), (v) the historical-biogeographical aspects should be incorporated in a biologically sensible way (e.g. long-term changes, ecological and evolutionary processes, population genetic structure, the taxonomic rank, conservation genetics), and (vi) a clear distinction between conservation status and responsibility of a specific political entity, which is often mixed in the methods reviewed here.

*Table 1: Summary of the criteria included in the different methods for priority setting in species conservation *.*

Species data required		$SPEC_{birds}$	$SPEC_{butterflies}$	NR_{birds}	$NR_{butterflies}$	$NR_{swiss\ birds}$	$NR_{Germany}$	$NR_{Hungary}$	PR_{Canada}
Red List status IUCN		+	+	+	+	+	+		+
Red List status European / national		+	+	+	+				+
EU Habitat Directive Annex II status								+	
National abundance (common/rare)						+			
Number of national sites/populations				+	+			+	
Assessed population	world	+						+	+
	Europe	+				+			
	national			+	+	+		+	+
Assessed distribution	world		+	+	+		+		+
	Europe		+						
	national			+	+		+		+
Endemism / biogeographical significance		+	+				+	+	+
Isolated “outposts” / ESU Marginal populations							+	+	
Distribution centre identified							+		
Size of the country						+			
Taxonomic unit									+

* The references for the different methods are: $SPEC_{birds}$ Tucker et al. 1994; $SPEC_{butterflies}$, van Swaay and Warren 1999; NR_{birds}, Avery et al. 1995; $NR_{butterflies}$, Warren et al. 1997; $NR_{swiss\ birds}$, Keller and Bollmann 2004; $NR_{Germany}$, Gruttke et al 2005; $NR_{Hungary}$, Varga et al., 2004, unpublished; PR_{Canada} (National Recovery Working Group Canada, 2005, unpublished.

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