



Critical review

Think globally, act locally: On the status of the threatened fauna in the Central Himalaya of Nepal

Prakash Kumar Paudel^{a,*}, Joel T. Heinen^b^a Nepal Academy of Science and Technology, GPO Box 3323, Khumaltar, Lalitpur, Nepal^b Department of Earth and Environment, Florida International University, Miami, FL 33199, USA

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ABSTRACT

The World Conservation Union (IUCN) publishes the Red List of Threatened Species, the most authoritative information available globally on the conservation status of species. However, the status of globally threatened species remains controversial at local levels because many of them are not protected as part of national statutory law. Such anomalies are examples of controversies in implementing the much-hyped environmental slogan “think globally, act locally”. Here we provide a comparative review between globally threatened species as listed by the IUCN Red List found in Nepal and those of nationally protected species under Nepalese law. We discovered a significantly higher diversity of globally threatened mammals and birds in Nepal than would be expected relative to their global ratios. We established remarkable disparities in species conservation in Nepal: (1) a large number (an average of 85% of species of five taxonomic groups: mammals, birds, amphibians, fishes and reptiles) of IUCN-listed globally threatened species found in Nepal are not protected by national law; (2) most protected species listed are mammals (70%), but more than half of globally-threatened mammals found in Nepal are not protected; and (3) amphibians and fish are not protected, although they represent 12% of the total number of globally-threatened species found in the country. Such large gaps in Nepalese conservation law are an indication of unresponsive and inefficient conservation planning. The Government of Nepal and international conservation partners should: (1) emphasize knowledge-based conservation strategies for all taxonomic groups; and (2) prioritize updating the lists of protected species.

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1. Introduction

Nepal falls within the Himalayan global biodiversity hotspot (Myers et al., 2000). The country harbours several 200 global eco-regions (Olson and Dinerstein, 1998), two endemic bird areas (EBA; Stattersfield et al., 1998), and many centres of plant diversity

(Heywood and Davis, 1995; Shrestha-Acharya and Heinen, 2009). The land area of Nepal is slightly under 0.1% of global land mass but contains a disproportionately large diversity of plants and animals (Paudel et al., 2012). For example, Nepal harbours over 2% of the flowering plants, 3% of the pteridophytes, 6% of the bryophytes, 3.9% of the mammals, 8.9% of the birds and 3.7% of the butterflies described worldwide (Paudel et al., 2012; Primack et al., 2013). Conservation of such rich biodiversity is a difficult challenge mainly because of poor conservation planning, limited resources (e.g., legal, human and financial), external markets for some wild

* Corresponding author at: Nepal Academy of Science and Technology, GPO Box 3323, Khumaltar, Lalitpur, Nepal.

E-mail address: pk.paudel@gmail.com (P.K. Paudel).

species (Heinen et al., 1995), and burgeoning human pressures on forest for firewood, fodder and timber (Paudel et al., 2012; Primack et al., 2013). Although protected areas, including buffer zones, cover more than 23% of the area of Nepal, they are not representative of national biodiversity and landscape features (Paudel and Heinen, 2015), and some faunal collapse among larger mammals, the most studied group, has been documented (e.g., Heinen, 2012, 1995). Therefore, a coherent conservation strategy for native species and ecosystems that are threatened by extinction should be a priority (Miller et al., 2007).

The World Conservation Union (IUCN) prepares a list of threatened species, namely critically endangered, endangered and vulnerable, using a standard and scientifically sound procedure (Akçakaya et al., 2000). Some argue that the list is of limited use at national levels due to its subjectivity, incomplete taxonomic coverage and global scope (Burgman, 2002; Possingham et al., 2002; Rodrigues et al., 2006). However, the species listed as threatened by IUCN are often protected through national level assessments (Brito et al., 2010; Miller et al., 2007). Thus the list has proven to be a useful tool for conservation planning, management, monitoring and decision making (Rodrigues et al., 2006). Here, we review the IUCN Red List of threatened fauna found in Nepal, the nationally protected species and their conservation action plans (SCAP), and new species discoveries within the country to: (1) compare Nepal's share of threatened fauna with that of world's threatened fauna; (2) assess whether threatened fauna found in Nepal are protected by national legislation; and (3) assess whether species conservation is responsive to new species discoveries.

2. Globally threatened species and nationally protected species: conservation assessments

The data used in our review on the national conservation of globally threatened species are based on the IUCN Red List of Threatened Species and those species legally protected species in Nepal. We obtained data on critically endangered, endangered and vulnerable species that occur in Nepal from the searchable database of IUCN's Red List of Threatened Species (www.redlist.org; IUCN, 2013). Similarly, we collected global data on the total numbers of species, the numbers of evaluated species for IUCN Red List criteria, and the numbers of threatened species by major taxonomic group from the webpage of IUCN's Red List of Threatened Species (IUCN, 2012).

To compare Nepal's share of threatened fauna with that of the global total, we focused on three taxonomic groups: birds, amphibians and mammals, as they have received substantial evaluation by the IUCN Red List of Threatened Species (IUCN, 2012). However, we considered five taxonomic groups, i.e. mammals, birds, amphibians, fishes and reptiles, to compare species protected by national legislation with those listed in the IUCN Red List of Threatened Species. Data on protected species of Nepal were obtained from National Parks and Wildlife Conservation Act of 1973 (NPWC Act 1973; Dongol and Heinen, 2012). The Act provides the major legal infrastructure for protecting biodiversity in Nepal; e.g., setting protected areas and their management, species conservation, etc. (Paudel et al., 2012). The Act has lists of protected plant and animal species that receive legal protection throughout the country. However, legal protection of species occurring outside of protected areas is ambiguous and hence they may not receive effective protection (Heinen et al., 1995; Paudel, 2012). We compared globally threatened birds, mammals, amphibians, fishes and reptiles found in Nepal with those legally protected by the Act. Data on new species discoveries in Nepal were obtained from Thompson (2009).

In order to analyze whether the observed numbers of threatened species of each taxonomic group in Nepal were different from

expected numbers, we used chi-square tests. The expected number of threatened species in each taxonomic group (birds, amphibians and mammals) in Nepal was obtained as follows. We first calculated ratios of global total number of threatened birds, amphibians and mammals to the global total number of threatened species of these taxonomic groups (i.e., global total number of threatened birds/global total number of threatened species of birds, amphibians and mammals). We then multiplied these global ratios of birds, amphibians and mammals by the total number of threatened species of these taxonomic groups found in Nepal to obtain the expected numbers of threatened species in each taxonomic group.

3. Global status and territorial protection: what about “think globally, act locally”

Altogether, 86 threatened faunal species that occur in Nepal are found in seven groups of animals: reptiles, 9; birds, 33; amphibians, 3; actinopterygii, 7; mammals, 31; insects, 2; and gastropods, 1. Birds and mammals contributed more than half of all threatened species. The ratio between the total numbers of threatened species of birds, amphibians and mammals in Nepal and the total numbers of species of those respective taxonomic groups found in Nepal was smaller than those ratios globally (Fig. 1a). However, the observed numbers of threatened birds and mammals found in Nepal were significantly larger than expected based on their global ratios (chi-square goodness of fit tests: $\chi^2 = 42.80$, $df = 2$, $P < 0.0001$; Fig. 1b). Threatened amphibians made up a very small proportion of Nepal's amphibian diversity, although they are expected to be higher than existing proportions (Fig. 1). It is notable that the amphibian diversity of Nepal is not well known and all threatened amphibians (*Nanorana minica*, *N. rostandi*, and *Scutiger nepalensis*) are endemic to the Himalaya (Thompson, 2009).

In Nepal, the Act is the main legal mechanism to establish protected areas and protect endangered species (Heinen and Kandel, 2006). The Act provides legal protection to 27 species of mammals (taxonomic updates suggest 26 species of mammals), nine species of birds and three species of reptiles. An average of 85% of species by taxonomic group, specifically mammals, birds, reptiles, fishes and amphibians, considered globally threatened were not nationally protected in Nepal. Conversely, about 55% of species protected nationally were not globally threatened. Although not all threatened species need to be protected by law – for example, some may be more common and unthreatened in some countries compared to others – such discrepancies are not justified. Developing a list of endangered species and placing it into binding law is a prerequisite for the protection of imperiled biodiversity (Heinen and Chapagain, 2002). Within the published literature there is as yet no systematic review covering the lack of congruence between protected species within the country and those that are listed globally as threatened. Similar comparative studies between the IUCN Red Lists of threatened species within country-level IUCN Red Lists of Threatened Species suggest such mismatches as low as 2% in Brazil, Colombia, China, and the Philippines (Brito et al., 2010).

Mammals and birds contributed nearly equally and made up the largest proportion of Nepal's threatened faunal diversity. Fishes and reptiles, followed by amphibians, had smaller shares of Nepal's total threatened species (Fig. 2). This is contradictory to the global trend where freshwater fishes and amphibians are more threatened and therefore require more conservation attention than mammals or birds (IUCN, 2012; Stuart et al., 2004). Although threatened mammals represent a disproportionately large proportion (70%) of the protected species listed in Nepal, nearly half of the globally-threatened mammals occurring in Nepal are not protected by national law. No threatened amphibians

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