

7

Conclusion

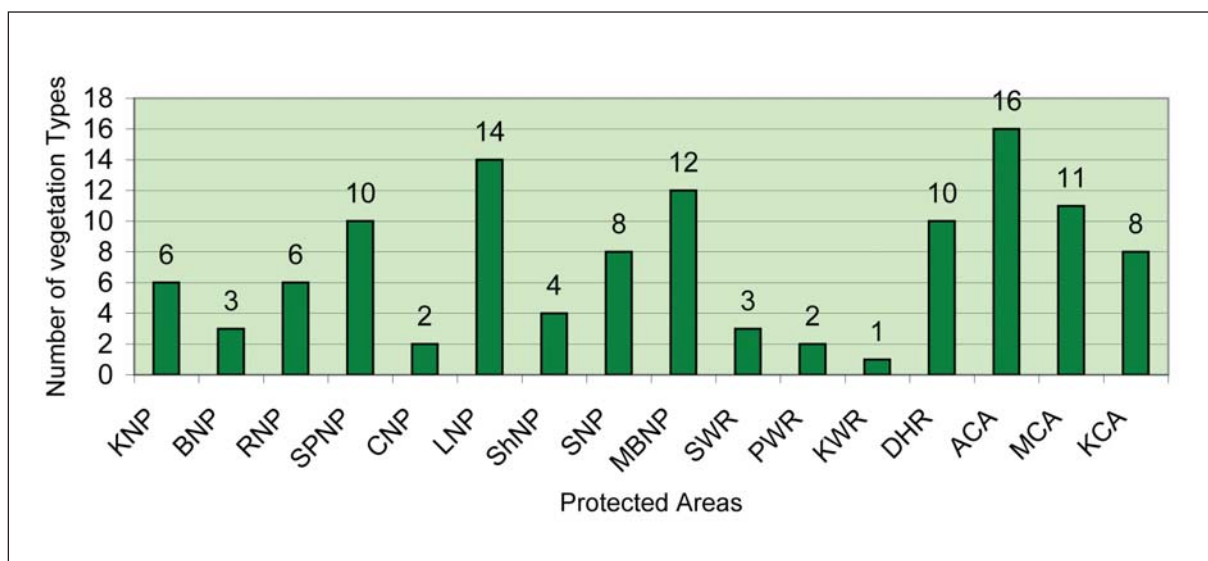
The inventory of Nepal's flora and fauna has been updated using BPN data as benchmarks. Biodiversity assessment has been discussed in **Chapter 3**, supported by relevant references and **Annexes 1 and 2**. Floral and faunal data have been assessed for 23 protected sites which include 16 protected areas, four Ramsar sites, and four World Heritage Sites and monument zones. The assessment focused on higher plants and animals. General checklists of plants and animals of Nepal have been prepared separately (**Annexes 1.2-1.4, 2.1-2.8**).

Vegetation types

Of the 36 types of vegetation as simplified from previous classifications, 31 are represented in 16 protected areas in Nepal: nine national parks, four wildlife/hunting reserves, and three conservation areas. Annapurna Conservation Area contains the highest number of vegetation types found in Nepal (16), followed by Langtang National Park (14), and Makalu-Barun National Park (12) (**Figure 4**).

The five types of vegetation not represented in the 16 protected areas are presented in **Table 29**.

Figure 4: Number of Vegetation Types in Protected Areas

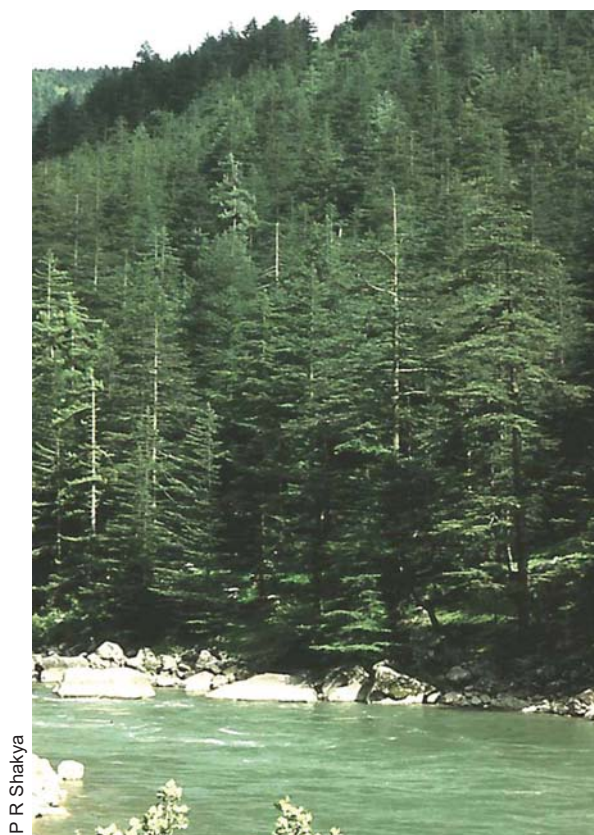
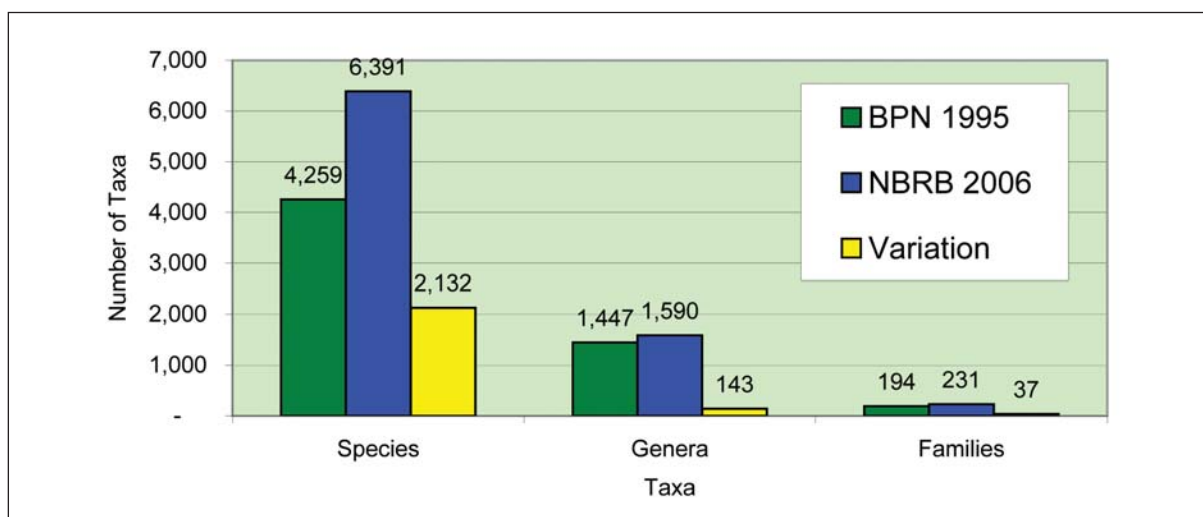


KNP=Kangchenjunga National Park; BNP=Bardia National Park; RNP=Rara National Park; SPNP=Shey-Phoksundo National Park; CNP=Chitwan National Park; LNP=Langtang National Park; ShNP=Shivapuri National Park; MBNP=Makalu-Barun National Park; SWR=Shuklaphanta Wildlife Reserve; PWR=Parsa Wildlife Reserve; KWR=Koshiappu Wildlife Reserve; DHR=Dhorpatan Hunting Reserve; ACA=Annapurna Conservation Area; MCA=Manaslu Conservation Area; KCA=Kangchenjunga Conservation Area; GTRS=Ghodaghodi Tal Ramsar Site; JRRS=Jagdishpur Reservoir Ramsar Site; BTRS= Bishazari Tal Ramsar Site; LWHS=Lumbini World Heritage Site; SWHS=Swayambhu World Heritage Site; PWHS=Pashupati World Heritage Site; CWHW=Changunarayan World Heritage Site

Table 29. Vegetation Types not Represented in the Protected Areas			
Vegetation Types	Altitude	Region	Districts
3222 Fir-Hemlock-Oak Forest	2800m-3300m	West	Sub-alpine mountain areas of Dailekh, Kalikot, Jajarkot, Rukum, Bajhang, Darchula
4132 Lithocarpus forest	2600m-3000m	East	Between Panchthar and Ilam
4133 Rhododendron forest	2600m-3000m	East	Meeting point of Taplejung, Tehrathum and Sankhusabha
4236 Olea forest	1500m-2000m	West	South Dolpa and North Rukum
5034 Eugenia-Ostodes forest	1000m-1700m	East	South-east Ilam

Source: TISC/NARMSAP/MFSC 2002, Annex 1.1

Figure 5. Comparison of Floral Taxa Recorded for BPN and NBY



P. R. Shakya

Cedrus deodara (Roxb. ex D. Don) G. Don, Cedar forest, Tila Valley, 1920m Jumla

Of these, four types grow in the Mid-Hills physiographical region, one can be found in the sub-alpine region, three are local to the eastern phytogeographical region, and two are found in the western region.

Flora

Diversity

The total count of flowering plant species recorded from Nepal by 2006 is 6,391, representing 1,590 genera and 231 families. This is a significant increase from the 4,259 species representing 1,447 genera and 194 families recorded in 1995 (Table 30, Figure 5). Detailed checklists are presented in Annex 1.4.

Recent records account that 2.76% of the total number of flowering plant species in the world are found in Nepal. This is an increase

Table 30. Comparison of Number of Taxa Recorded for BPN and NBY			
	BPN 1995	NBY 2006	Variation
Species	4259	6391	2132
Genera	1447	1590	143
Families	194	231	37

Sources: BPP 1995 and Annex 1.4

from the earlier record of 2.36%. Nepal's share of pteridophytes at the global level is 5.15%, an increase from earlier records of 4.45% (**Table 8**).

Endemic plants

The present number of flowering plant species endemic to Nepal is 399. The 1995 records presented 246, which has been reduced by 40 species possibly due to extinction of eight species and 32 newly reported species elsewhere. In spite of the reduction in recorded numbers, 185 species including infraspecific taxa have been added to the checklist of endemic plants in Nepal, bringing the total to 399. The High Mountain region, with high plant endemism (63%) indicates a more active speciation rate than in the Mid-Hills (38%) and Terai/Siwaliks (6%).

Threatened and protected species

Of the total 6,391 plants in the current Nepal checklist, the 34 species which have been included in the **IUCN Red List** is approximately only 0.5% of the nation's wealth of flora. This indicates that the plants species found in Nepal appear to be abundant and common.

Seventy-two plant species are commercially important for their biomaterial values. The Government of Nepal has banned the commercial exploitation of 18 plant species including seven species of trees. But the list of plant species in the CITES appendices counts 139 recorded species, of which two are in Appendix I, 132 are in Appendix II, and five in Appendix III.

Species in protected sites

According to the flowering plant checklists records for 2006, there are 2,532 species of vascular plants represented by 1,034 genera and 199 families in the protected sites (**Annex 1.9**). Of the total 399 endemic species, 130 species are found in the protected sites (**Annex 1.5.1**). Variations in records may be due primarily to varied intensity of floral explorations in the given sites.

On average, there are 40% more records of flowering plant species in the **Nepal Biodiversity Resource Book** than in **Biodiversity Profile Nepal** (BPN) estimates for the protected areas. The Shuklaphanta Wildlife Reserve records are over two times the BPN estimates; the Dhorpatan Hunting Reserve record is only 5% of the Biodiversity Records Nepal estimates (**Table 31**).



Cardiocrinum gigantum (Wall.) Makino, Makalu Barun National Park, 2180m

P. R. Shakyia



Meconopsis horridula Hook.f. & Thoms, Jaljale area 4500m, Taplejung

P. R. Shakyia

From the protected areas, Langtang National Park contains the highest number of vascular plant species (1,043, and the least numbers (58) are in the Dhorpatan Hunting Reserve. From the Ramsar sites, 388 vascular plant species have been recorded in Ghodaghodi Tal compared to



P. R. Shakya

The slipper orchid, *Cypripedium himalaicum* Rolfe, Machhapuchre base camp, 3450m

37 in Beeshazar and Associated Lakes, although both are in similar climatic zones. Among the World Heritage Sites, Swayambhu records 109 vascular plants, Changunarayan records 21, although they are in similar climatic and physiographic zones (Table 31). These differences in recorded numbers illustrate that floral exploration efforts in the protected sites are still inadequate.

Fauna

Diversity

A comprehensive account of Nepal's mammalian fauna was produced by Suwal and Verheugt (1995), who listed 181 mammal species belonging to 12 orders and 39 families found in Nepal. Four mammal species believed to be extinct in Nepal are the Cheetah (*Acinonyx jubatus*), Black musk deer (*Moschus fuscus*), Pigmy hog (*Sus salvanius*), and Indian chevrotain (*Moschiola meminna*). There are also four new

Table 31. Comparison of BPN Estimates and Actual NBY Records of Flowering Plants

SN	Protected Areas	BPN Estimates	NBY Records	% of NBY/BPN	Number of Vascular Plant Species
1	Khaptad NP	567	289	51	295
2	Bardia NP	839	167	20	173
3	Rara NP	1,070	88	8	88
4	Shey-Phoksundo NP	1,579	174	11	174
5	Chitwan NP	919	227	25	234
6	Langtang NP	3,689	976	26	1,043
7	Shivapuri NP	2,122	449	21	449
8	Sagarmatha NP	1,074	160	15	160
9	Makalu-Barun NP	3,073	280	9	284
10	Shuklaphanta WR	202	535	265	553
11	Parsa WR	919	293	32	298
12	Koshitappu WR	237	154	65	158
13	Dhorpatan HR	1,150	58	5	58
14	Annapurnna CA	3,430	451	13	456
				(Average) 40	
15	Manaslu CA				587
16	Kangchenjunga CA				77
	Ramsar Sites				
17	Ghodaghodi Tal				388
18	Jagdishpur Reservoir				16
19	Beeshazar and Associated Lakes				37
	World Heritage Sites				
20	Lumbini				72
21	Swayambhu				109
22	Pashupati				74
23	Changunarayan				21

Sources: BPP 1995 and Annex 1.9; NBY records 2006

additions to the BPN mammals list: the Binturong (*Arctictis binturong*), Indian mongoose (*Herpestes nyula*), Himalayan marmot (*Marmota himalayana*), and Tibetan gazelle (*Procapra picticaudata*) (Table 12). The current checklist includes 185 mammal species.

In general, the number of reported fauna species has increased since 1996. Over 651 butterfly species have been recorded in 2006. This is an increase from the BPN records of 643 in 1996 (Table 32) (BPP 1996).

A new field of entomology has opened with the introduction of the IUCN Red List and others publications on floral and faunal species. The publications, for example, recorded 536 species under 17 orders from *Protura to Odonata* in 1997 (Thapa 1997), and 789 species of moth, and 656 species of butterfly in 1998 (Thapa 1998). Remarkably, 1,131 of the 5,052 known species of insects in Nepal, or over 22%, have been discovered and described first from Nepali specimens (Thapa 1998).

Global comparison

According to NBRB records, 3.96% of the total number of mammal species worldwide are found in Nepal. (Earlier records showed 4.2%.) A similar calculation for bird species indicates that Nepal has 8.9% of the global total of bird species. (BPN calculation place the figure at 8.5%). In terms of fish species, records report that Nepal accounts for just 1.87% of the global total freshwater fish species, a decrease from the BPN calculation of 2.2%. NBRB records 3.72% species of butterflies from Nepal, a decline from 4.2%, which is the BPN calculation. In the case of herpeto fauna, the number of amphibians reported accounts for 2.47% of the total global amphibian species. BPN calculated 1.1% for amphibians. NYRB records of Nepali reptiles constitute 0.99% of the global scale; this is a decrease from the BPN calculation of 1.5% (Table 33).

Distribution

Species distribution may be viewed from two distinct perspectives: confinement, and richness.

Year	Mammals	Birds	Herpeto	Fish	Butterfly	Moth	Spider
BPP1996	181	843	143	185	643	-	144
NBRB 2006	185	874	195	187	651	789	175

Source: BPN 1996, NBY 2006

Life Form	NBY	BPN
Mammals	3.96	4.2
Birds	8.90	8.5
Amphibians	2.47	1.1
Reptiles	0.99	1.5
Fish	1.87	2.2
Butterflies	3.72	4.2

Source: BNP 1996, NBY 2006

Confinement: The Terai-Siwaliks region harbours the highest number of confined species compared to Nepal's other physiographical regions: 35 mammal species, 111 bird species, 46 herpeto species, and 106 fish species (Table 13).

The central phytogeographical region harbours the highest number of confined species compared to the eastern and western regions: 28 mammal species, 24 bird species, 40 Herpeto species, and 31 fish species (Table 14).

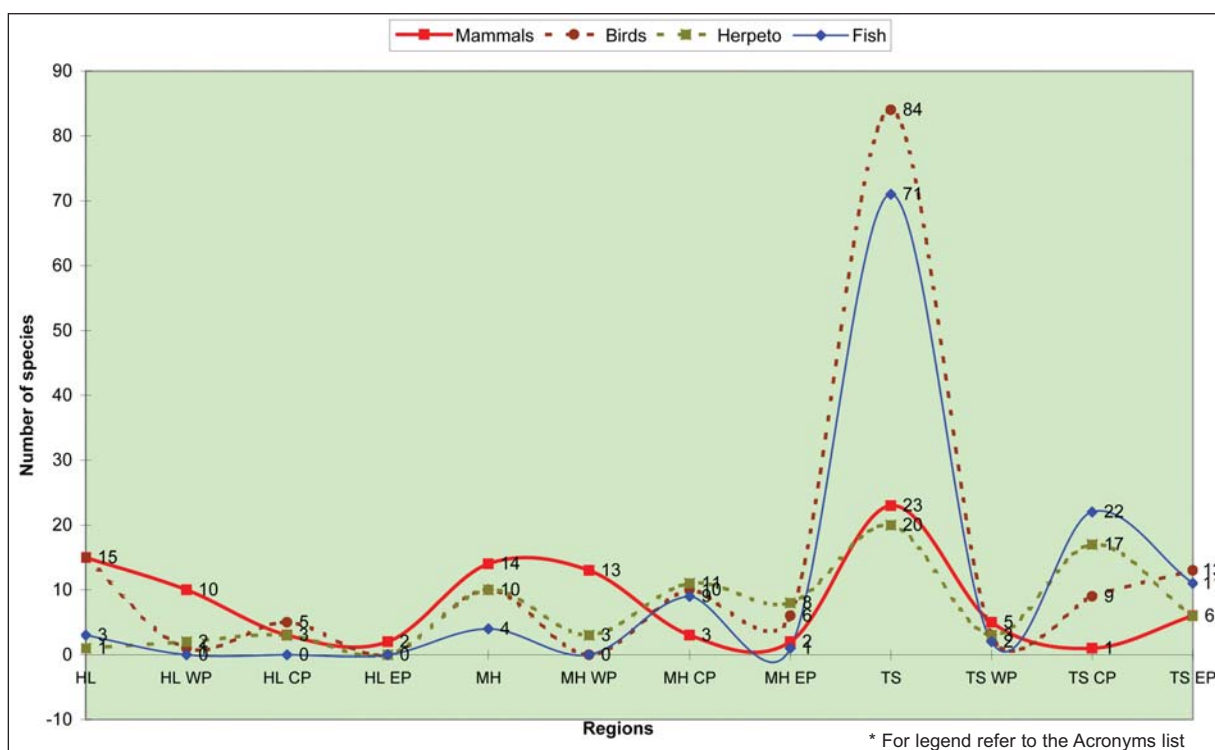
The central Terai-Siwaliks region hosts the highest number of confined species.

There are 11 mammal species, three physiographical and three phyto-geographical, found in all nine regions of the country. Eleven other mammal species are not reported in any of these regions. Of the birds species, 104 species are found in all nine regions, but 41 species are not reported in any of the regions.

Richness: Among the nine regions, the Mid-Hills centre harbours the highest number of mammal (55%) and bird species (77%); the Terai-Siwaliks centre harbours the highest number of herpeto species (45%); and the eastern Terai-Siwaliks houses 74% of fish species. Overall, the Mid-Hills centre is the most abundant in species distribution, followed by the Terai Siwalik centre, Terai Siwalik East, Terai Siwalik West, Mid-Hills East, Highlands Centre, mid-hills West, Highlands East, and Highlands West (Table 16 and Figure 6).

The Annapurna Conservation Area harbours 97 mammal species, or more than half of the total 181 mammal species found in Nepal. Other protected sites rich in mammal species are Makalu-Barun National Park (44%), Bardia National

Figure 6: Regional Faunal Species Confinement



Park (BNP) (32%), Chitwan National Park (CNP) (31%) and Rara National Park (28 %). In terms of bird species, CNP harbours 539 species (62%), followed by Parsa Wildlife Reserve (58%), Koshitappu Wildlife Reserve (55%), Annapurna Conservation Area (54%), and Bardia National Park (47%). CNP and ACA are home to 29% herpeto species, followed by BNP (22%) and Lumbini World Heritage Site (LWHS) (20%). CNP and BNP are home to 66 % of the fish species, followed by Koshitappu Wildlife Reserve (56 %), and LWHS (24 %) (Table 34).

Endemism

The only recorded endemic mammal in Nepal, the Himalayan field mouse (*Apodemus gorkha* Thomas, 1924), is found in the central mid-hills and High Mountain regions. In the case of birds, an endemic Nepal species, the Spiny Babbler (*Turdoides nipalensis*), is found throughout the Terai-Siwaliks and Mid-Hills regions. The subspecies Nepal Kali (*Lophura leucomelanos leucomelanos*) is also endemic to the country (Inskipp, C 2000), and found in the western regions.

Fourteen species of herpetofauna and six species fish are endemic. Of them, three species of herpeto each are found in eastern and western regions, and four species in the central region. Four species of herpeto are found in the Terai-

Siwaliks, and seven in the Mid-Hills. In case of fish, one species is found in the eastern region, and three in western regions. Similarly, two species of fish are found in the Mid-Hills, and three species in the High Mountains.

Threatened and protected species

Threatened species

The NRDB lists 59 mammal species, 279 bird species, 35 herpeto species, and 34 fish species, of which four species of mammals and seven species of birds are believed to have become extinct, according to the updated checklists. Of these, two species: the Cheetah (*Acinonyx jubatus*) and Black musk deer (*Moschus fuscus*) have probably never been recorded in Nepal; the Pigmy hog (*Sus salvanius*) and the Indian chevrotain (*Moschiola meminna*) have probably now become extinct (Table 33) (IUCN-Nepal 1995).

According to the NRDB, seven species of birds (Table 18) have become extinct, among which four species have been reported again recently. Of the 11 bird species listed as Extinct in Nepal in the BPN (BPP 1995), three species have been reported again recently. The Hodgson's hawk-cuckoo (*Hierococcyx fugax*) was sighted in Koshitappu Wildlife Reserve (Baral, HS 2005); the Black-breasted parrotbill (*Paradoxornis flavirostris*) in the Annapurna Conservation Area

Table 34. Distribution of Faunal Species in the Protected Sites

Sites	Mammal		Bird		Herpeto		Fish	
Protected Areas	#	%	#	%	#	%	#	%
Khaptad National Park	23	12	287	33	23	12	-	-
Bardia National Park	59	32	407	47	42	22	124	66
Rara National Park	51	28	241	28	2	1	3	2
Shey Phoksundo National Park	35	19	208	24	3	2	-	-
Chitwan National Park	58	31	539	62	56	29	124	66
Langtang National Park	45	24	345	39	4	2	2	1
Shivapuri National Park	19	10	311	36	3	2	-	-
Sagarmatha National Park	33	18	208	24	5	3	1	1
Makalu Barun National Park	81	44	421	48	14	7	13	7
Shuklaphanta Wildlife Reserve	46	25	351	40	7	4	28	15
Parsa Wildlife Reserve	37	20	503	58	8	4	8	4
Koshiappu Wildlife Reserve	23	12	485	55	17	9	105	56
Dhorpatan Hunting Reserve	18	10	137	16	2	1	0	0
Annapurna Conservation Area	97	52	476	54	56	29	2	1
Manaslu Conservation Area	21	11	193	22	-	-	-	-
Kangchenjunga Conservation Area	13	7	280	32	-	-	-	-
Ramsar Sites								
Ghodaghodi Tal Ramsar Site	34	18	96	11	9	5	23	12
Jagdishpur Reservoir Ramsar Site	6	3	45	5	9	5	18	10
Beeshazar and Associated Lakes Ramsar Site	26	14	271	31	18	9	25	13
World Heritage Sites								
Lumbini World Heritage Site	26	14	207	24	39	20	44	24
Swayambhu	6	3	64	7	-	-	-	-
Pashupati	9	5	63	7	-	-	-	-
Changuarayan	7	4	51	6	-	-	-	-
Sources: Annexes 2.11 to 2.33								
Sources: BPP (1995 No. 6 & 13), KMTNC 2005, and DNPWC 2000								
Available http://www.cites.org/eng/app/appendices.shtml								
Available http://www.iucnredlist.org								

(Suwal, RN. 2003); and Long-tailed sibia (*Heterophasia picaoides*) in Chitwan National Park (BES 2006). The fourth species, the Green cochoa (*Cochoa viridis*), was already listed in the bird checklist of the Makalu-Barun National Park - BPN Technical Report Number 14 (BPP 1995h, and Jackson et al. 1990) (Table 35).

Altogether, IUCN lists 173 species of mammal species. Nearly 94% of the 185 species are threatened; the Pigmy hog (*Sus salvanius*) is critically endangered; 21 are vulnerable; 19 are near threatened; 120 of least concern; and one, Csorba's mouse-eared bat (*Myotis csorbai*) is Data Deficient

Of the total 874 species of birds three species are critically endangered: the Slender-billed vulture (*Gyps tenuirostris*), Pink-headed duck (*Rhodonessa caryophyllacea*), and White-

rumped vulture (*Gyps bengalensis*). Six species are considered endangered; 23 vulnerable; 25 near threatened; and 813 are of least concern (IUCN 2006) (Table 35).

Similarly, 64 species of herpeto or about 34% of the totals are listed in the IUCN Red List. Of them, one is considered critically endangered; three are endangered; seven vulnerable; four near threatened; 39 of least concern; and ten as data deficient (Table 35).

Protected species

Twenty-seven mammal species, nine bird species, and three reptile species are listed as protected under the National Parks and Wildlife Conservation Act 1973 (Annex 2.5 to 2.8). However, 10 species of fish and 12 species of butterflies are still in need of protection (HMGN/MFSC 2002).



The musk deer (*Moschus chrysogaster*), Sagarmatha National Park

In 2003, the Government of Nepal approved a 'Working Policy on Wild Animal Farming, Breeding and Research'. Under this provision, seven species of mammals, one species of amphibian (the Gharial crocodile, *Gavialis*

gangeticus), all 77 species of snakes, and 874 species of birds, including three protected species, are protected (**Annex 2.9**) (GoN/MFSC 2003).

Sixty-six species of mammals are listed in the CITES Appendices. Of these, 28 species are in Appendix I, 14 in Appendix II, and 24 in Appendix III. Similarly, 128 species of birds in the Appendices, of which 16 species are in Appendix I, 95 in Appendix II, and 17 in Appendix III, and 11 species of reptiles are included in the Appendices, of which there are four each in I and II, and three in category III. Five species of amphibians are in Appendix I, and ten in Appendix II. From the insect group, three species of butterflies are included in Appendix II (**Table 35**).

Species in protected areas

With regards to fauna, the number of birds reported in the protected areas had increased since 1996. For example, 483 bird species

Table 35. Number and Status of Faunal Species

[illegible]

Table 36. Faunal Data of Protected Areas

SN	Protected Areas	Mammals		Birds		Herpeto		Fish	
		BPP	NBY	BPP	NBY	BPP	NBY	BPP	NBY
1	Khaptad NP	18	23	219	287	2	23	0	0
2	Bardia NP	48	59	260	407	27	42	50	124
3	Rara NP	51	51	212	241	2	2	3	3
4	Shey-Phoksundo NP	26	35	175	208	1	3	0	0
5	Chitwan NP	56	58	483	539	56	56	124	124
6	Langtang NP	45	45	289	345	4	4	2	2
7	Shivapuri NP	19	19	149	311	1	3	0	0
8	Sagarmatha NP	34	33	199	208	5	5	1	1
9	Makalu-Barun NP	81	81	399	421	14	14	13	13
10	Shuklaphanta WR	32	46	267	351	3	7	28	28
11	Parsa WR	25	37	483	503	8	8	8	8
12	Koshitappu WR	23	23	199	485	17	17	105	105
13	Dhorpatan HR	18	18	137	137	2	2	0	0
14	Annapurna CA	92	97	474	476	56	56	2	2
15	Manaslu CA	0	21	0	193	0	0	0	0
16	Kangchenjunga CA	0	13	0	280	0	0	0	0

Sources: Annexes 2.11 to 2.26

were listed in Chitwan National Park in 1996; in 2006 their record numbers had increased to 539. In Koshitappu, the 199 species reported in 1996 had increased to 485 in 2006. An opposite trend appears in the case of mammals. The number of species reported in 2006 has decreased by one in Sagarmatha National Park, due to the inability to report on the Black musk deer (Table 36).

Of 181 total surviving mammal species excluding four extinct species, 28 species are found outside protected sites – protected areas, Ramsar sites and World Heritage sites (Table 24). Fifteen of these species are bats (total 37 species); 10 species are shrew, rats, and Pikas; the remaining three are the Large-toothed ferret badger (*Melogale personata*), Malayan porcupine (*Hystrix brachyura*), and Tibetan antelope (*Pantholops hodgsoni*).

Three species found in all 20 protected sites are the Golden jackal (*Canis aureus*), Rhesus macaque (*Macaca mulatto*), and Common leopard (*Panthera pardus*).

Of 867 bird species excluding the seven extinct species, 37 species (5%) are found outside the protected sites (Table 24). Of these 37 species, 14 are migrant species, four are summer/winter visitors, and 19 are resident birds.

One-third of the total 65 herpeto species are found outside protected sites, as are 25 species of fish (Table 24). There are 56 species of herpeto fauna found in the Annapurna Conservation Area and Chitwan National Park, and none at all in the Manaslu and Kangchenjunga conservation areas. Similarly, there are 124 fish species in Bardia and Chitwan national parks; 105 in Koshitappu Wildlife Reserve; and none in five protected areas.

With regards to herpetofauna, the number of reported species in all protected areas has increased. Similarly, the number of fish species in Chitwan National Park was recorded at 125 in 1996, and only 124 in 2006. The increasing number in fauna indicates substantial biological research and explorations done since 1996.

Separate lists of fauna species have been prepared for globally significant areas such as the Ramsar and World Heritage sites (Table 37). Much less research related to these areas has been conducted compared to studies on protected areas. Data is therefore limited and not conclusive enough to do sufficient analysis.

Based on the 2006 records, Annapurna Conservation Area records the highest number of species (97) of the 185 mammals in the current checklist, followed by Makalu-Barun National Park (81); and least (13) in Kangchenjunga

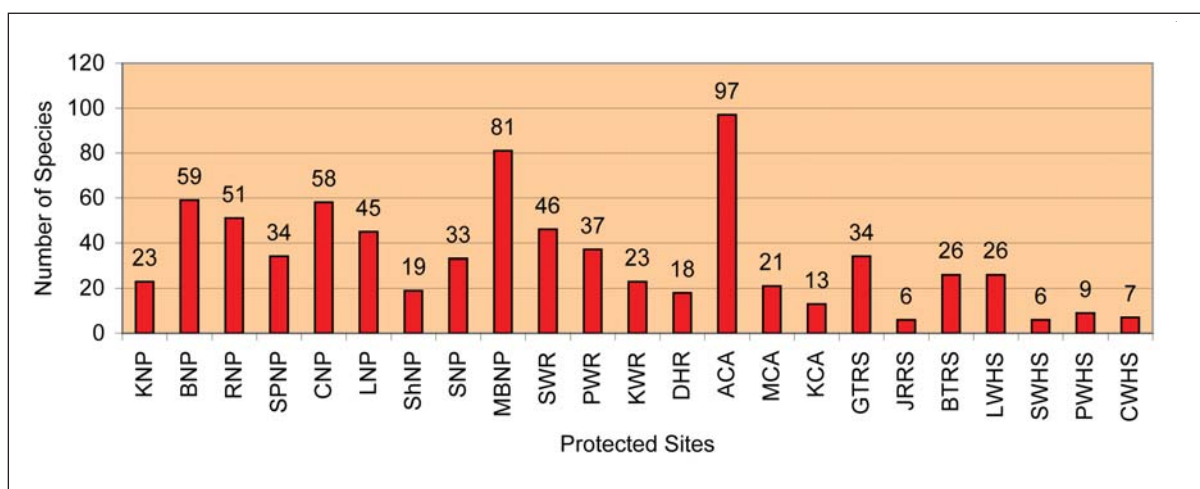
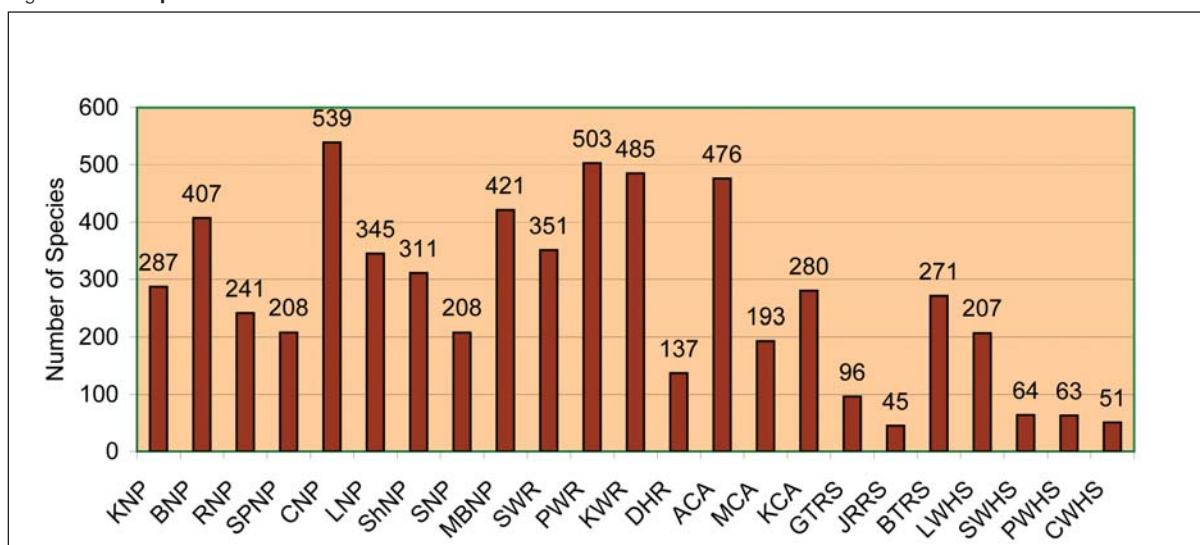
Table 37. Faunal Data of Nepal Ramsar Sites and World Heritage Sites

Areas	Mammals	Birds	Herpeto	Fish
Ramsar sites				
Ghodaghodi	34	96	9	23
Jagadishpur	6	45	9	18
Beeshazar	26	271	18	25
World Heritage sites				
Lumbini	26	207	39	44
Swayambhu	6	64	0	0
Pashupati	9	63	0	0
Changunarayan	7	51	0	0

Sources: Annexes 2.27 to 2.33

Conservation Area. Similarly, there are 34 species in GTRS, and only six in JRRS. Nine species have been recorded in Pashupati, and six in Swayambhu (Annex 2.27 to 2.29, and Figure 7).

Based on the 2006 records, Chitwan National Park records the highest number of species (539) of the 874 birds in the current checklist, followed by Parsa Wildlife Reserve (503), and only 137 in Dhorpatan Hunting Reserve. Two hundred seventy-one species are found in Bishazari Tal Ramsar site (also called Beeshazar and Associated Lakes), 45 in the Jagdishpur Reservoir Ramsar site, 64 in Swayambhu, and 51 in Changunarayan (Annex 2.30 to 2.33, and Figure 8).

Figure 7: Mammal Species in the Protected Areas**Figure 8: Bird Species in the Protected Areas**

KNP=Kangchenjunga National Park; BNP=Bardia National Park; RNP=Rara National Park; SPNP=Shey-Phoksundo National Park; CNP=Chitwan National Park; LNP=Langtang National Park; ShNP=Shivapuri National Park; MBNP=Makalu-Barun National Park; SWR=Shuklaphanta Wildlife Reserve; PWR=Parsa Wildlife Reserve; KWR=Koshi Tappu Wildlife Reserve; DHR=Dhorpatan Hunting Reserve; ACA=Annapurna Conservation Area; MCA=Manaslu Conservation Area; KCA=Kangchenjunga Conservation Area; GTRS=Ghodaghodi Tal Ramsar Site; JRRS=Jagdishpur Reservoir Ramsar Site; BTRS= Bishazari Tal Ramsar Site; LWHS=Lumbini World Heritage Site; SWHS=Swayambhu World Heritage Site; PWHS=Pashupati World Heritage Site; CWHHS=Changunarayan World Heritage Site

Variations in the recorded number of faunal species in protected sites are primarily on account of differing intensities of biological explorations in the sites.

Ex-Situ conservation and specimens preservation

Botanical gardens and herbaria

Apart from conservation of species in the wild, efforts have been made towards ex-situ conservation and specimen preservation.

There is a network of 11 botanical gardens of Nepal, which represent the central and western mid-hills and Terai-Siwaliks regions, and the eastern mid-hills region. The High Mountain regions and the eastern Terai-Siwaliks region are not represented in this network.

Godavari, Nepal's central botanical garden, contains nearly 300 species of plants including 89 species of trees, 26 species of shrubs, 140 species of herbs including 90 species of orchids, 12 species of climbers, and 31 exotic trees and shrubs.

The National Herbarium (KATH) houses over 161,800 specimens of plants, and the Central Department of Botany of the Tribhuvan University (TUCH) houses 20,000 specimens.

Captive breeding and translocation

The Central Zoo in Lalitpur houses 119 species of 970 animals. It features 33 of the 206 mammal species, 60 of the 321 bird species, 17 of the 424 fish species, and nine of 19 reptiles species found in Nepal (**Annex 2.10**). The Hetauda Municipality Zoo houses some species including the spotted deer, barking deer, hares, birds, and tortoises.

Captive breeding of crocodiles has been carried out successfully in the Gharial Farm in Chitwan. A total of 661 gharials bred in captivity were released into the major rivers of Nepal such as the Narayani, Kali Gandaki, Koshi, Karnali, and Babai between 1978 and 2005. In addition to gharial crocodiles, the breeding centre has also succeeded in hatching elongated tortoise (*Indotestudo eleongata*) and marsh crocodiles.

There are 171 domesticated elephants in Nepal, of which 77 belong to the government, nine to Nepal Trust for Nature Conservation, and 85 to the private sector. The elephant breeding centre at Khorsor in Chitwan, and the elephant stables in Shuklaphanta, Bardia, Chitwan, Parsa, and Koshitappu are noteworthy for successful breeding of elephants.

Since 1986, translocation of rhinos has been successfully carried out with Chitwan National Park providing the gene pool. Between 1986 and 2003, a total of 87 rhinos (39 males, and 48 females) have been translocated to Bardia National Park (83) and Shuklaphanta Wildlife Reserve (4). Translocation of blackbucks from the Central Zoo to Bardia National Park was initiated in 1992, and also to Pashupati World Heritage site quite recently.

Specimen preservation

The Natural History Museum houses about 55,000 biological specimens, including over 40,000 zoological specimens (invertebrates and vertebrates), over 9,000 botanical specimens (flowering and non-flowering plants), 100 skeletons, some skins, fossils, rocks, and minerals; plastic and clay models, and wildlife trophies. The wildlife museums in the protected areas have preserved a number of specimens of wildlife and plants, the majority of which are found locally.



Tengboche, Sagarmatha National Park
(Govinda Joshi)