

## Introduction

China is a magnificent country and one of the most diverse on Earth. Its size ranks fourth among the world's nations (9,596,960 km<sup>2</sup>), and it is home to over 1.3 billion people. The topography of China ranges from the highest elevation on Earth (Mount Everest, or Chomolungma; 8,850 m) to one of the lowest (Turpan Basin; 154 m below sea level). Chinese environments include some of Earth's

most extensive and driest deserts (the Taklimakan and Gobi) and its highest plateau (the Tibetan Plateau or “Roof of the World”). Habitats range from tropical to boreal forest, and from extensive grasslands to desert (see the habitat images, map 1, and map 2). This wide variety of habitats has contributed greatly to the richness of China’s mammal fauna. Additionally, the geographic location of China, at the suture zone between the Palearctic and Indo-Malayan biogeographic regions, further contributes to the country’s mammal diversity. Overall, more than 10 percent of the world’s species of mammals live in China (556/5,416); an additional 29 species of cetaceans live in offshore waters (see Appendix I). Almost 20 percent (106/556) of China’s mammals are endemic, and one of these is among the most recognizable of the world’s mammals, the Giant Panda. China is considered a “megadiversity” country and has the third highest diversity of mammals among all countries (following Brazil and Indonesia).

## China’s Geography and Mammal Biogeography

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There have been many attempts to describe China’s diverse landscape. Conventionally, China has been divided into three major physical geographic regions: the Tibetan (Qinghai-Xizang) Plateau, northwest arid China, and eastern monsoon China (map 3).

The Tibetan Plateau is one of the highest and most remote landscapes on Earth. The plateau averages between 3,000 and 5,000 m in elevation and encompasses roughly a quarter of China. The word “plateau” is a misnomer, as this area is crisscrossed by numerous impressive mountain chains, such as the Anyemaqin Shan, Bayan Har Shan, and Tanggula Shan, and many smaller spur ranges. Nevertheless, approximately 70 percent of the plateau is composed of alpine meadow or semisteppe vegetation. The Qaidam Basin, an interesting area of tectonic collapse, is found at the northern extreme of the plateau at an elevation of only 2,600 m.

The arid northwest encompasses about 30 percent of China and represents an eastern extension of the great Eurasian deserts and grasslands. One of the world’s most desolate deserts, the Taklimakan (translation: “those who go in do not come out alive”) lies north of the Tibetan Plateau and the Kunlun Mountains. The cooler Dzungarian Basin, China’s second-largest desert, lies in the far northwest. Various smaller deserts extend to the east, increasingly interspersed with semidesert and temperate steppe grasslands. Finally, the rocky Gobi Desert occupies the northern part of China and extends into Mongolia. Two of Asia’s major mountain ranges break up this barren expanse in the northwest: the Tian Shan and the Altai. One can stand below sea level in Turpan Basin and clearly see the snow-capped top of Bogda Feng (in a spur of the Tian Shan) at 5,445 m.

Eastern monsoon China comprises about 45 percent of the country but is home to roughly 95 percent of China’s human population. This land is crossed by major rivers that originate on the Tibetan Plateau, most notably the Huang He (Yellow River), Yangtze and Mekong. Almost all of the arable land has been converted to agriculture, and much of the original forest habitat has been destroyed. Most of this landscape is low in elevation and consists of broad alluvial valleys, coastal plains, and modest ancient mountain ranges. The south is seasonably humid, and the plains are punctuated by dramatic limestone pillars. The climate

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becomes increasingly temperate toward the north, with deciduous trees giving way to expansive coniferous forests in the far northeast.

These physical geographical regions, however, do not adequately define the major biogeographic divisions in China. Biogeographically, China's flora and fauna have been affected by both historical factors (their derivation from two formerly isolated biogeographic realms—the Palaearctic and the Indo-Malayan) and their relative ability to colonize new habitats.

The southern boundary of the Palaearctic realm varies in breadth from western to eastern China. The zone of overlap between the Palaearctic and Indo-Malayan realms along the southern boundary of western China is compressed, as this region is defined by high elevational relief. In contrast, in areas of low relief (such as in eastern central China), the zonation is determined more by latitude than elevation, and there is a broad latitudinal band of overlap between forms that originated from the Palaearctic and Indo-Malayan realms. In the south this zone extends from about 28° N on the coast to roughly 25° N in the area in northern Yunnan where the three great rivers (Yangtze, Mekong, Salween) lie in close proximity. The northern edge of this zone essentially follows the Yangtze River from the east coast to the area where the three great rivers come together. This description contrasts with previous opinions that the southern limit of the Palaearctic in China largely corresponds to the latitude of the Huang He in eastern China (about 30° N).

An objective and comprehensive approach to understanding the zoogeography of Chinese mammals has been developed recently (Xie et al. 2009). This approach defined 124 biogeographic units in China based on a comprehensive suite of factors (elevation, landform, climate, vegetation, hydrology, etc.); maps of 171 diagnostic mammal species were then overlaid on these units. A statistical analysis identified aggregations of biogeographic units based on mammal distributions, and this information was used to create cluster dendrograms. This analysis produced a classification of the boundaries dividing the mammal fauna at different spatial scales across China. A similar analysis was performed on 509 representative plant species.

The biogeographical divisions of mammals and plants in China determined by the methodology outlined above contrast significantly with the commonly used physical geographical regions for China. Additionally, there are distinctive differences between the biogeographical divisions using the plant and mammal data. Four major biogeographical divisions occur in China based on vegetation: northeast, southeast, southwest, and northwest. These in turn can be broken down into 8 subareas and 27 regions (see map 2 and table 1). Compared with the physical geographical regions, the major divisions based on plants separate the arid northwest into western and eastern sections, and eastern monsoonal China into northern and southern parts. The southwest China biogeographical region for plants is basically similar to the Tibetan Plateau physical geographic region, although both the northern and southern boundaries of the biogeographical region are found farther south than the physical geographical region (map 3).

There are three major biogeographical divisions for mammals (map 3 and map 4). As with the plants, the mammals have distinctive western and eastern distributions in the arid northwest geographical region; the divisional boundary

**Table 1.** China's Biogeographic Divisions

Areas	Subareas	Regions	
I. Northeast China	Ia. Inner Mongolia steppe and northeastern China plain	1. Greater Xing'an Mountains	
		2. Northeastern China plain	
	Ib. Lesser Xing'an and Changbai mountains	3. Nei Mongol arid steppe and desert grassland	
	Ic. Northern China	4. Ordos Plateau arid and desert grassland	
II. Southeast China	IIa. Central China	5. East of Northeast China	
		6. Northern China	
		7. Huangtu Plateau forest grassland and arid grassland	
	IIb. Highlands and plains in the south to Yangtze River	8. Huaibei Plain and plains of the middle and lower Yangtze River	
		9. Qinling and Daba mountain mixed forest	
		10. Sichuan Basin agriculture	
		11. Southeast China hills and basins evergreen broadleaf forest	
		12. Yangtze River southern bank evergreen broadleaf forest	
		13. Yunnan-Guizhou Plateau evergreen broadleaf forest	
	IIc. Coast and islands of southern China	14. South to Nan Ling evergreen broadleaf forest	
		15. Southern Yunnan tropical monsoon forest	
		16. Hainan and Leizhou Peninsula tropical rain forest and monsoon forest	
III. Southwest China	IIIa. Southeast and south of Tibetan Plateau	17. Taiwan island evergreen broadleaf forest and monsoon forest	
		18. South China Sea islands tropical rain forest	
		19. Southern Sichuan and Yunnan Plateau evergreen broadleaf forest	
	IIIb. Central and northern Tibetan Plateau	20. Eastern Tibet and Western Sichuan incisive hill coniferous forest and alpine meadow	
		21. Himalayan Mountains	
		22. Northeast Tibetan Plateau	
		23. Western and central Qinghai-Tibetan Plateau	
		IV. Northwest China	24. Alashan Plateau temperate desert
			25. Eastern Tian Shan temperate desert
			26. Northern Xinjiang
		27. Tarim Basin and Kunlun Mountains	

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for mammals occurs farther west than that for plants (map 3). The mammals also separate eastern monsoonal China into northern and southern areas, and the boundary for mammals is further south than that for plants. In the large arc from northwest to southeast China, there is a single mammal biogeographical boundary compared with two for plants. Mammals in the interior drainage area on the Tibetan Plateau have northern affinities. The southeastern plateau region shows a continuous extension in faunal affinities to the southeast, maintaining a mammal fauna more similar to that of monsoonal southeastern China.

In northwest China the montane forests and grasslands of the Tian Shan and the Altai Mountains clearly are distinct from the surrounding arid landscape. The Altai (region F3, map 4) shows clear ties to the fauna of Russia's boreal forest. As a result, some biogeographers link the Altai with the Greater Xing'an Mountains of northeast China. However, more than twice as many Altai mammals occur simultaneously in the Tian Shan and the arid Dzungarian Basin as in the Greater Xing'an Mountains. In northeast China there are distinct differences in vegetation between the Greater and Lesser Xing'an mountains (regions 1 and 5, map 2), whereas mammal distributions are similar between these ranges, and the area can be classified as a single region (region A, map 4).

Overall, this analysis demonstrates that the ability to colonize varies between plants and animals, producing distinctive differences in the cluster analysis and the designation of major biogeographic areas in China. While plant distributions tend to be closely tied to prevailing environmental conditions, mammals generally exhibit broader geographic tolerance. Additionally, mammal distributions appear to be truncated by major rivers and mountain chains, whereas these do not appear to be as stringent barriers to plant distributions. Thus plant divisions appear to be more reliable than those of mammals as a general descriptor of China's biogeography.

## Mammal Conservation

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The mammals of China have been seriously threatened by a variety of anthropogenic causes. Few Chinese landscapes appear today as they occurred in the past; there has been an extreme loss of natural habitat, and natural habitats have increasingly become fragmented and isolated from one another. Chinese mammals have been harvested or poached heavily and unsustainably for food, products, and the pet trade. Native species have been subject to widespread poisoning campaigns. Additionally, the presence of alien invasive species, pollution, and litter has degraded many natural habitats. We fear that finding many Chinese mammals in the regions indicated on our distribution maps may not be possible today. One of our motivations for writing this guide is to attract attention to the Chinese mammal fauna so that effective conservation measures can be enacted.

The government of China understands the gravity of biodiversity loss. China is signatory to most major conservation conventions, such as the Convention on International Trade in Endangered Species (CITES; 1981), the Convention on Wetlands (Ramsar; 1992), the World Heritage Convention (1985), and the Convention on Biological Diversity (CBD; 1993). China has hosted a large number of major conservation workshops and congresses. The China Council for Interna-

tional Cooperation in Environment and Development (CCICED) has served as a model organization linking Chinese and international specialists in order to address issues of conservation and sustainable development. These efforts, however, often fall short in their implementation, resulting in ongoing threats to China's mammal diversity.

A first step in any conservation agenda is to recognize those species most in need of protection. In the species texts, we have listed the threatened species categorizations for Chinese mammals using four separate criteria, in this order: China (national) Species Red List, China State Key Protected Animal List, CITES appendix designation, and IUCN (global) Red List. We also present additional conservation information, when available, for each species. The instruments used for categorizing threatened species have distinctive characteristics and notations, as given below.

### **IUCN Red List**

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The IUCN (International Union for Conservation of Nature) Red List is one of the most respected indicators of the threatened status of species. The IUCN Red List presents the global status for a species using five independent quantitative criteria: (A) Population Reduction (measured as declines in population over time); (B) Geographic Range (extent of occurrence or area of occupancy); (C) Small Population and Decline; (D) Very Small or Restricted Population; and (E) Quantitative Analysis. Within each of these main criteria are additional refined criteria. Threatened species may qualify under any of these criteria for a listing as Critically Endangered (CR), Endangered (E), or Vulnerable (VU). Additionally, species can be listed as Near Threatened (NT), of Least Concern (LC), Extinct (EX), or Extinct in the Wild (EW). Some species cannot be listed because they are Data Deficient (DD), and others have not been evaluated (NE). In 2008 IUCN completed the Global Mammal Assessment, which classified the global Red List status of all mammals. These results are reported here for all Chinese mammals, unless updated subsequently (through January 2012; <http://www.iucnredlist.org/initiatives/mammals>).

### **China Species Red List**

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To complement the IUCN global Red Listing process, and to allow countries and regions to develop their own conservation priorities, IUCN developed a parallel mechanism for listing threatened species at national levels. These quantitative criteria take into consideration the extent of a species' range within a host country and other applications to tailor the IUCN Red Listing process to national levels. These criteria were followed in an ambitious effort to determine the Red List status all of China's mammals (Wang and Xie 2009). These evaluations include two additional categories: Regionally Extinct (RE), for those species that are now extinct in China although they exist elsewhere in the world; and Not Applicable (NA), for those species that are distributed at the margin of China and for which data are lacking (even though there may be sufficient data for a global assessment). All of China's mammals were assessed against these regional criteria; the only species for which we do not present a China Species Red List category are

those whose taxonomy has changed since the workshops were held to produce the China Species Red List.

### **China State Key Protected Animal List**

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China's State Key Protected Animal List identifies select mammals as either Category I or Category II species. This national schedule of protected fauna is heavily skewed toward charismatic megafauna and is primarily composed of primates, carnivores, marine mammals, and ungulates. The representation on this list is not truly indicative of the overall threat across all taxa of mammals in China. The formulation of this list was initiated by the Chinese Endangered Species Scientific Commission and authorized by the Ministry of Forestry. Inclusion of species on the list was derived by consensus at an interactive workshop comprised of species specialists from throughout China. The State Key Protected Animal List was finalized soon after the People's Congress issued China's Wildlife Law in 1989.

### **Convention on International Trade in Endangered Species of Wild Fauna and Flora—CITES**

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Those species of mammal believed to be negatively affected by trade are listed in CITES appendixes. The Appendix I classification incorporates those mammals that would be threatened with extinction if traded. Trade in specimens of these species is permitted only in exceptional circumstances. Appendix II includes species not necessarily threatened with extinction, but for which trade must be controlled in order to avoid utilization incompatible with their survival. Listings on CITES Appendix I or II are current to late December 2011 (<http://www.cites.org/eng/app/index.php>).

### **China's Protected-Area System**

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Biodiversity conservation can take many forms, but one of the most recognizable is the establishment of nature reserves and protected areas, coupled with their effective management, to ensure that a decline in biodiversity does not occur. Thus, protected areas remain one of the best ways for governments to ensure biodiversity preservation, as well as serving as magnets for eco-tourists who desire to observe native species. Initially, few areas were protected, but the Chinese government has recently stepped up efforts to protect areas rich in biodiversity. By the end of 2010 over 8,000 protected areas had been established in China (not including Taiwan and Hong Kong), encompassing over 18 percent of China's land area (see map inside back cover).

Most of these were established after 1980, many after 1995. Of these areas, over 2,500 nature reserves (under the management of more than 10 governmental agencies) cover over 15 percent of the land area. Additionally (and sometimes overlapping) are 2,800 forest parks (State Forestry Administration), over 800 scenic landscape and historical sites (Ministry of Housing and Urban-Rural Development), over 300 geological parks (Ministry of Land and Resources), over 100 national wetland parks (State Forestry Administration), nearly 500 national

water conservation scenic areas (Ministry of Water Resources), and 2,500 above A-grade scenic spots (National Tourism Administration).

The decision to protect species-rich areas in China stems from the belief that these lands will help define the national culture, assist in economic development among rural people, and provide destinations for tourists. Their function is to promote the retention of natural capital, provide flood control, and preserve biodiversity. However, in spite of the positive strides made in protected-area management in China, more work needs to be done to ensure that these lands will continue to support mammal biodiversity. China's protected areas are mainly found in the sparsely populated west. Many protected areas in China are small and isolated, minimizing their effectiveness in the preservation of biodiversity. Often they are poorly managed and insufficiently funded; in some instances key programs have been initiated that are actually counterproductive to the preservation of biodiversity (such as poisoning native wildlife). Incursions and poaching by people living outside of protected areas jeopardize their success. Nevertheless, the protected-area system in China has great potential to protect mammal biodiversity. With improved management, China's protected areas can become sites in which the study and viewing of mammals are enhanced.

## How to Use This Book

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We present available data on the systematics, distribution, and natural history of the 556 species of mammals found in China. The order of presentation follows the higher-level classification (from order to family to subfamily) as outlined in *Mammal Species of the World*, third edition (Wilson and Reeder 2005). Genera (within a family or subfamily) and species (within a genus) are alphabetized within a taxon. All taxa are identified by both their scientific and common names in English. Chinese names are given in both character and pinyin format. We have given a single English common name for each species, basically following the naming convention used in *Mammal Species of the World*. Many species are known by more than one common name, but we believe that the application of a single name will, over time, eliminate confusion and enhance the ability of mammalogists to communicate.

We present brief descriptions at each level of classification. Information given for each species includes distinctive characteristics, distribution, natural history, and conservation status. The depth of treatment reflects the information available for each species.

## Distinctive Characteristics

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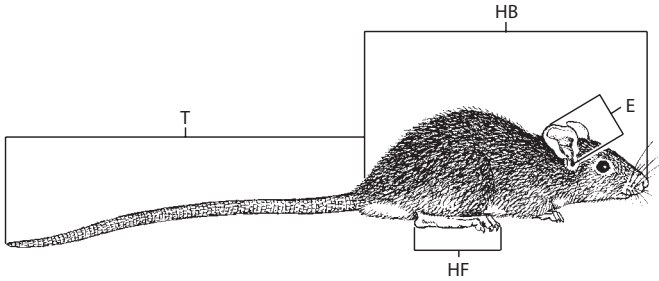
Standard specimen measurements are given for each species, when available. These include head and body length (HB); tail length (T); length of hind foot (HF); and ear length (E) (fig. 1); as well as greatest length of skull (GLS). Bat measurements include forearm length (FA) (fig. 2). Shoulder height (SH) is presented for most larger mammals. These measurements are given in millimeters, unless otherwise stated for large mammals. Body mass (Wt) is given when available. The dental formula for a species (or other taxon) is presented as the upper incisors (I), canines (C), premolars (P), and molars (M)/lower incisors (i),



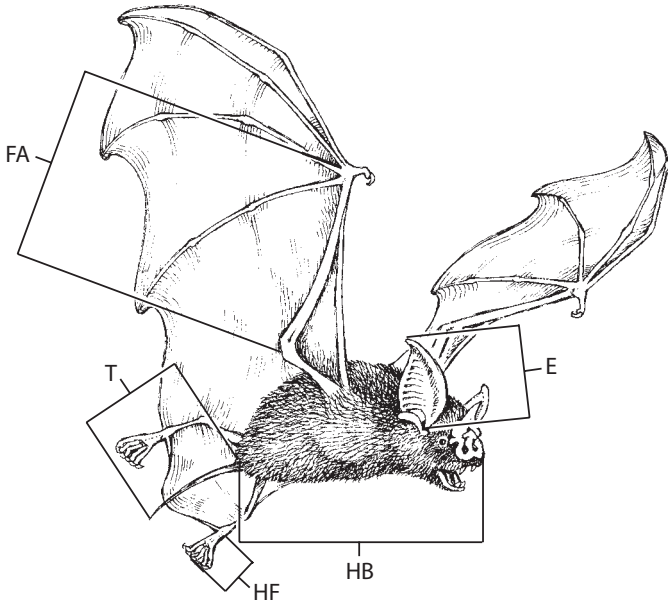
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canines (c), premolars (p), and molars (m), followed by the total number of teeth (e.g., 2.0.3.3/1.0.2.3 = 28).

A description of the appearance of each species and its distinctive characteristics follows. Drawings of 384 species (69 percent of Chinese mammals) accompany these descriptions. Our artist, Federico Gemma, examined specimens from the Institute of Biology, Chinese Academy of Sciences, Beijing, as well as the



**Figure 1.** Standard external measurements used in the species accounts: HB = head and body length; T = tail length; HF = hind foot length; E = ear length.



**Figure 2.** Standard external measurements used in the species accounts for bats: HB = head and body length; T = tail length; HF = hind foot length; E = ear length; FA = forearm length.

American Museum of Natural History, New York, and Smithsonian Institution, National Museum of Natural History, Washington, DC, to capture the color and nuances of each species; only a few drawings depict species that were not represented in these collections. He also visited the Beijing Zoo collection, which contains most of the large mammal species found in China. Additionally, authors made available to Gemma original photographs, other printed material, and Internet sources to assist with his depiction of species.

## Distribution

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A brief description of the distribution in China is given for each species, along with its range outside of China or the statement that the form is endemic to China. Every species description is accompanied by a map of its distribution in China. In a few cases we present separate maps of the historical and contemporary distribution of a species; otherwise the maps depict the original range of the species in China before any potential recent contraction of the range due to anthropogenic factors (see Mammal Conservation). Each map portrays the actual localities (dots) where a species has been found (or collected) in China. We present the maps in this manner, rather than as shaded range maps, for several reasons. First, the topography of China is so varied that any attempt to shade in a distributional range would inevitably present a misleading indication of the area(s) the species actually inhabits. Second, dot maps, such as we present, provide a gestalt for how well known or represented the species is in China; for example, common species are represented by hundreds of dots and tend to be very well understood, whereas those portrayed by only a few localities are generally poorly known.

The localities presented on maps were derived from data from the China Species Information Service. Data in CSIS were gathered using a variety of sources and recorded at the county level. The primary data included original locations from specimens housed at major mammal collections in China (Institute of Zoology, Chinese Academy of Science) and the United States (American Museum of Natural History; National Museum of Natural History), as well as published locality records from Chinese scientific surveys, journal articles, and Chinese provincial and regional mammal guides. All data added to CSIS were cross-referenced to their source, so that in verifying maps each author had available the data source for each locality. The original data entered for each map could have been corrupted for a number of reasons, including misidentification of specimens and out-of-date nomenclature. Thus, every map was reviewed carefully and updated. We believe that these maps portray the distribution of all mammal species in China in the most accurate form possible at the present time, although some of these distributions may need further definition.

## Natural History

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While information on the natural history of many Chinese mammals is fragmentary, some species are among the most widely recognized on Earth. We focus on the habitat requirements, mode of life, diet, and reproduction for each species, drawing from a variety of sources.

### Conservation Status

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We list the conservation status as determined by the China Species Red List analysis, the category from the China State Key Protected Animal List, the appropriate CITES appendix, and the IUCN global Red List analysis. Not all species have been categorized using all four of these criteria; we include only those that have been so evaluated. Details on each of these forms for assessing conservation status are found above.

### Additional Material

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Appendixes review those marine mammals that are found off the coast of China but are not included as a part of the Chinese fauna (Appendix I), those species whose distributional ranges appear very close to the Chinese border and may eventually be found in China (Appendix II), and those mammal species that have been introduced into China (Appendix III).

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