

Wildlife Conservation in China: the Problem of Priorities

WILLIAM BLEISCH

The Wildlife Conservation Society and the Conservation Biology Center at the Kunming Institute of Zoology

(Received June 6, 1994)

ABSTRACT

Resources for biodiversity conservation in China are limited, so careful planning is needed to make best use of available resources. Establishing priorities for conservation action is complex because local, national and global perspectives can give rise to different priorities. I illustrate this by considering priorities for conservation of wildlife diversity in China's forests. Priorities among different conservation strategies are also an important consideration. Protected areas and captive breeding programs can be considered as two tactics from a range of options which differ in intensity of management, cost and effectiveness.

Key words wildlife, forests, protected areas, captive breeding

1 Background

China hosts an estimated 13% or so of the world's vertebrate species, including many species found in no other countries (Shi, 1993). Thus, conservation of biodiversity in China is recognized as an important task not only within China, but by international organizations dedicated to preservation of biodiversity.

At the same time, conservation of biodiversity faces many formidable obstacles in China. China is also home to 1/5th of the world's people on 1/8th of the world's arable land. Most of these people are concentrated in China's east and south, which is also where some of China's most species rich and most threatened ecosystems are located.

Biodiversity in China is threatened from past and current destruction of natural habitats by deforestation, by "reclamation" of wetland habitats and by introduction of non-native species. Wholesale destruction of natural habitats threatens entire ecosystems and all of the unique species they contain. For example, in Yunnan Province, lowland wet evergreen forest habitat has been estimated to once have covered 10 000km², but now less than 30 of this remains (MacKinnon, 1990).

Many individual species are threatened not only by habitat destruction, but also by over-harvesting. Over-hunting for bush-meat has eliminated many once-common species from former habitats in China. Gibbons (*Hylobates* spp.) and peafowl (*Pavo muticus*) are two examples of species that have become very rare in their former habitats as a result of over-hunting for the table. Species that are hunted or collected for market are in special danger of over harvesting. China lacks the

resources to regulate harvesting of these species, and several species of economic value have been driven to the brink of extinction by the high price of skins or parts. Rhinoceros, historically found in China, were probably extinguished in Yunnan Province in the recent past by the extraordinarily high prices offered for rhino horn. Tiger (*Panthera tigris*) are on the brink of extinction in Yunnan, and over-hunting, fueled by the high prices offered for tiger bone is certainly one of the main reasons. Some species, such as pygmy loris (*Nycticebus pygmaeus*) and certain parrots, are under threat from over-collection for pet trade. Captive breeding programs, designed in part to save endangered species, may actually threaten them by encouraging collection of too many animals from the wild.

2 *Establishing priorities for conservation action*

Despite these serious problems, China has made impressive strides towards saving its biodiversity. Although there seems to be little sympathy in China and other countries for view that species have an intrinsic right to exist, there is a strong belief that conservation of biodiversity is an important national priority because of the extrinsic value of biodiversity. Biodiversity is widely understood to be valuable in China for traditional medicines, for economical products and as part of China's natural heritage. In 1957, the Chinese government established a system of Forest Reserves and the first Natural Protected Areas. In 1962, "Instructions of Active Conservation and Rational Utilization of Wildlife Resources" recognized the importance of wildlife species and gave many species legal protection. In more recent years, significant additions have been made to China's system of Natural Protected Areas and efforts have been started to stem the tide of habitat destruction within these areas.

However, China lacks the financial and human resources to effectively protect all of the natural habitats and species in need of protection. By the standards of many developed countries, China's nature reserves are desperately understaffed. Since economic reform was introduced in China, most Natural Protected Areas in China have been made responsible for generating most of their operating budgets locally. This has forced the staff of many reserves to spend much of their time and energy on sideline industries, leaving them little time for patrols and other protection measures. China's reserves has been able to get some help from international organizations interested in helping China to save its biodiversity for posterity. But these organizations are also working in many other countries, and often have to balance needs in China with needs in other regions.

All of this points to the importance of careful planning, so that the limited resources available for biodiversity conservation can be used with the most effect. The first step in this planning should be a prioritization of needs, based on the best scientific information available. But how do we set these priorities? What are the most important activities and what can wait? This is far more difficult to do than might be thought. There is no reason to think that it will be easy to reach a consensus among all parties on how conservation needs should be ranked. In fact, priorities will be set differently at different levels, depending on the scale of the focus of the organization making decisions. A few examples might help to clarify my point.

China boasts 20 species of primates. Five of these species are not found outside of China; the

Chuan, Dian and Qian snub-nosed langurs (*Rhinopithecus rozelana*, *R. bieti*, and *R. brelichi*), the Tibetan macaque (*Macaca thibetana*) and the Formosan macaque (*M. cyclopsis*). China has spent considerable time and money on efforts to conserve these species, and all of them have also attracted help from foreign and international organizations such as The Wildlife Conservation Society, WWF, foreign governments and foreign zoos. Here, there is no substantial difference in the national and international priorities for conservation.

A species does not have to be endemic to China for conservation efforts in China to arouse international concern and support. The black-crested gibbon (*Hylobates concolor*) is found in Yunnan Province and on Hainan Island in China, but also occurs in northern Viet Nam and Laos. Given the extent of forest destruction in northern Viet Nam and the lack of effective protection of endangered wildlife in Viet Nam and Laos, the best hope for saving this species may lie in China's Ailao and Wu Liang Mountain Reserves (Bleisch et al., 1990). Conservation of this species in China has received considerable local and international attention.

In China, the white-handed gibbon (*Hylobates lar*) is found only in a small portion of the 70 km² Nangunhe Natural Protected Area. This species is highly endangered in China, and might also be considered a high priority for conservation activities by China and Yunnan Province. However, conservation of this species in China receives no mention in the IUCN/SSC Primate Specialist Group's Action Plan for Asian Primate Conservation (Eudy, 1987). The reason is that this same species is well-protected in Thailand in several large reserves, including Khao Yai National Park and Thung Yai and Huai Kha Khaeng Wildlife Sanctuaries. Thus, despite its high priority for China, China can expect little support from international organizations for conservation of this species^①.

A similar difference in priorities can arise when considering conservation priorities for entire regions or ecosystems. Tropical broadleaf forest habitat in Yunnan Province is estimated to have once covered nearly 42 000 km², but by 1990 less than 17 000 km² remained, a loss of 60%. Much of what remains is in Xishuangbanna, and there, about 570 km² is protected in the 20 000 km² Xishuangbanna Natural Protected Area (MacKinnon, 1990). This small region is host to a huge proportion of China's total biodiversity, including over 20% of China's mammals and over 30% of China's birds. It is obviously a high priority for anyone interested in preserving China's storehouse of biodiversity, and conservation activities in Xishuangbanna have attracted a great deal of attention from Chinese government agencies and from foreign funding organizations such as WWF-International and the MacArthur Foundation.

However, if one takes a global view, rather than considering China's biodiversity in isolation, Xishuangbanna loses some of its importance. Few of the species found there are not also found outside of China's borders. For example, considering large wildlife species, white-cheeked gibbons (*Hylobates leucogenys*), rufous-necked hornbills (*Aceros nipalensis*) and Indochinese tiger are all found in Xishuangbanna and are all high priorities for conservation action, but Xishuangbanna does

① There may be other reasons why primatologists in China and internationally would be interested in the gibbons of Nan Guang He. It is possible that this region still has both *Hylobates lar* and *H. concolor* in sympatry. The zone of contact between these two species would provide interesting opportunities for scientific study of behavior and evolution in gibbons. If these two species still come in contact there, the conservation of the gibbons of Nan Gun He should be given high priority both within and outside of China.

not protect large populations of any of these species and it is unlikely that Xishuangbanna will play a deciding role in their conservation. That is because the habitat types represented in Xishuangbanna are also well—represented in neighboring Laos, Burma and Vietnam, and substantial populations of these species still exist in these neighbor countries. In contrast to China, biodiversity conservation in these neighbor countries has received relatively little international attention until recently, but as they open their doors to help from foreign conservationists, we can expect that there will be a shift in conservation resources into these neighboring regions. In the not too distant future, China may face the prospect of protecting Xishuangbanna's biodiversity without large amounts of foreign help.

This is in marked contrast to habitats such as the subtropical forests of south-western and central China. These forests are the only habitat for many species which cannot be found outside of China's borders. These endemic species include such charismatic flagship species as the giant panda (*Ailuropoda melanoleuca*), the Chuan and Qian snub-nosed monkey (*Rhinopithecus roxelana* and *R. brelichi*), Sichuan hill partridge (*Arbophila rufipectus*), golden pheasant (*Chrysolophus pictus*) and Reeves's pheasant (*Syrmaticus reevesii*), as well as many lesser-known species such as the Emei Shan Liocichla (*Liocichla omeiensis*) and Biet's laughingthrush (*Garrulax bieti*) (De Schauensee, 1984; Collins, 1988). Other ecosystems which are more or less unique to China include the high-altitude desert and grasslands of the Tibetan Plateau and the riverine and wetland ecosystems of China's Yangtze and Yellow River systems. In these cases and others, many species, and indeed entire ecosystem, are unique to China or can only be saved in China. Both Chinese and foreign conservation organizations can be expected to continue to focus their attention on efforts to protect significant amounts of natural habitat in these regions.

3 *In situ and ex situ conservation*

So far, I have mainly considered efforts to conserve species in the natural habitats they are native to by habitat protection. This has been labelled *in situ* conservation (Conway, 1989). In contrast, much attention has focused on conservation of Chinese wildlife species by captive breeding, a form of *ex-situ* conservation. Many conservation professionals in China have privately expressed the opinion that there is little hope for wildlife in the wild in China and that most species will have to be maintained in captivity. But is this realistic? How many species will need to be maintained and how much space will this require?

Although conservation strategies for species survival should be considered on a case by case basis, principles of conservation biology suggest that, for most species, the minimum number of animals that must be maintained in a captive breeding program in order to avoid dangerous levels of inbreeding depression and loss of genetic diversity will be on the order of 100 individuals (Lacy, 1992). Given that zoos worldwide now house less than about 600 000 individual vertebrates, excluding fish (Conway, 1989), we might just hope with perfect management to be able to save all of the 698 species of mammals, 1047 birds, 191 reptiles and 63 amphibians listed in the IUCN Red Data Book (WCMC, 1990) by captive breeding alone. But this does not even begin to address the needs of the 762 species of fish and 2250 invertebrates identified as threatened and it is probably a gross

underestimate of the number of species that should be given immediate attention (Diamond, 1989). If we expect captive breeding programs to shoulder the responsibility for our failure to protect natural habitats, then many, many more species will have to be added to the list, and zoos and captive breeding centers will very soon run out of space.

Captive breeding is best thought of as only one of several conservation strategies, each requiring different amounts of management and human intervention (Conway, 1989). On this basis, we might classify conservation facilities into six "reserves", ranging from less to more intensive^②. Class I reserves are near-pristine habitats where the native flora and fauna are more or less intact in their original abundances. There are few such areas left in the world, and many are in the relatively low-diversity polar or high altitude zones. Class II reserves are regions which are still reasonably undisturbed, but in which hunting and habitat destruction have shifted the ecological balance between species and even eliminated some important species, such as top carnivores. This would characterize most natural protected areas in the world today. Class III reserves are areas which have been severely altered by human activities, but which never-the-less retain significant populations of species of concern. Like the two classes above, class III reserves are *in situ* conservation strategies, although management in these reserves may necessarily be much more intensive. Class IV reserves are conservation areas set up outside of the natural habitat of the species, and where it therefore requires constant and intensive management. This would include deer parks, monkey islands and safari ranches and other *ex situ* conservation facilities, where animals are provisioned and kept at artificially high densities. Class V reserves would correspond to zoos, captive breeding centers or other intensive management zones, where there is usually little or no attempt to mimic natural habitat conditions. Class VI "reserves" would include frozen zoos of cryogenically preserved embryos and cell banks (Shi, 1993), as well as nonliving specimens stored in museum collections.

Each class of reserve presents its own special management problems. Captive breeding programs must deal with the constant threat of loss of valuable genetic diversity in the captive populations. Any small population of animals will tend to lose genetic diversity by the simple random process known as genetic drift. In fact, the rate of loss of genetic diversity is roughly proportional to the inverse of population size, so that a population of 10 animals will lose diversity at twice the rate as a population of 20. Once genetic diversity is lost in captivity, it may be extremely difficult to reintroduce the animals to the wild. In the wild, a population with low genetic diversity may be especially vulnerable to epidemics, and may be unable to adapt quickly enough to survive a changing environment (Gilpin et al., 1987).

By careful planning of mating partners, the rate of loss of genetic diversity can be slowed substantially by zoo biologists. However, there is still the largely unstudied threat of domestication, the slow loss of the adaptations necessary for survival in the wild once selection pressures are removed by the "easy" life in captivity. Cultural adaptations, those transmitted by learning and not by genetic inheritance, can be lost in one generation of captivity. For example, among higher primates the knowledge of what is edible and how to find it in the wild seems to be passed down from mother to

② I have borrowed this scheme from the six classes of protected inland waters proposed by Moyle and Leidy, 1992.

offspring by direct observation. This may be one reason why reintroduction of captive-reared primates has proved to be extremely difficult (Pearl, 1992).

In general, we might expect it to be difficult to transfer animals from a higher number reserve where intensive management is the rule to a lower number reserve, and even more difficult to move several classes at once. Thus, for most large mammals for which reintroduction has been tried, it has been found to be extremely difficult, perhaps impossible to reintroduce animals from captive-rearing facilities to wild habitats. In contrast, translocation of animals from one area of natural habitat to another has met with more success (Griffith et al., 1989). Plans for reintroduction of wild horses and Pere David's deer to their natural habitat have both involved an adaptation phase in a kind of Class IV reserve, rather than calling for direct release of animals raised in the Class V zoo environment into a Class III nature reserve.

For some species and some kinds of transfers, we do not currently have the technology and knowledge necessary for the task. Once a Class I reserve loses its complement of big cats or other large carnivores, it may be impossible to reintroduce them, both for biological and for political reasons. Although few details are available, reintroduction of captive bred or orphaned orangutans and chimpanzees into the wild does not seem to have resulted in successful natural breeding, despite several years of intensive efforts (Pearl, 1992). And despite Jurassic Park's success at the movie theaters, it will probably be many years before developmental biologists figure out how to reconstruct a living animal from DNA stored in museum specimens, or even from frozen living cells.

The six classes of reserves also differ in cost, and generally the cost of conservation tends to increase with the increasing class of the reserve, at least up to Class V. This is because the intensity of management required increases. Animals in natural habitat usually can be counted on to find their own food, to find mates, to reproduce and to raise young with little or no human assistance. In a captive breeding setting, all of these events require constant and dedicated human intervention.

Consider the relative cost of captive breeding program and a nature reserve. It has been estimated that it will cost over one million U. S. dollars to establish a new captive breeding facility for pandas in Chengdu. In contrast, roughly the same amount is needed to expand and improve the system of Natural Protected Areas for panda conservation to insure the pandas persistence in the wild, yet the forests in this reserve system would support not only a viable populations of pandas, but also 27 other endangered or threatened mammal species (MacKinnon, 1990), not to mention numerous other species of plants and animals, many found nowhere else. In 1986, it cost an estimated \$3300 to maintain one colobine monkey in a western zoo for one year (Conway, 1986) and it might cost one third of a million for a complete conservation strategy based on captive breeding alone, yet the operating budget for the entire Xishuangbanna Natural Protected Area system is probably less than one million each year, and this reserve system supports significant populations of no less than six primate species, as well as almost 100 other mammal species, over 400 bird species and an estimated 4000 species of plants (Xu et al., 1985).

For some species which have reached a crises of endangerment, *ex situ* management may be an important component of an overall conservation strategy that also includes habitat protection, translocation, captive breeding and reintroduction. Captive breeding and other intensive forms of *ex*

situ conservation are best thought of as short-term strategies to maintain species endangered in the wild until the time when their survival in the wild can be assured. In the case of species extinguished from part or all of their former range, captive management can be usefully combined with reintroduction or translocation programs. As a strategy for maintaining threatened species over the long term, captive breeding simply will not suffice. Ultimately, we must hope that all species can be maintained in their natural habitats, where each can fill its natural role in the ecosystem and where the species can continue to adapt and evolve.

Of course, there may be other motives for giving captive breeding a high priority as a conservation strategy. Captive breeding may help with efforts to educate the public and to rally support for conservation efforts. It can be an effective way to generate money from rare species, many of which are in great demand for zoos, for research or for the trade in animal parts for medicines. But it should not be the final solution for any species. For these reasons and others, most international conservation organizations are now looking at captive breeding as the choice of last resort and they are putting more of their limited resources into efforts to save biodiversity *in situ*.

4 Conclusion

The prospects for saving significant amounts of biodiversity in China are not grim. Although China has an enormous population which puts tremendous pressures on natural resources, China has also managed to progress rapidly through the difficult "demographic transition" so that the end of rapid population growth is now within sight. China has a legacy of environmental destruction to heal and many new and serious environmental problems to overcome, but Chinese planners have also shown a healthy capacity to learn from the mistakes made by other countries, and Chinese researchers are finding many creative solutions to these problems. China's rapid economic development and educational gains should give conservationists much hope that the dark days of needless habitat destruction and extirpation of species will eventually end. However, resources for biodiversity conservation, both from Chinese and foreign sources, are in limited supply. Careful consideration of priorities is important so that we may save as much as possible of China's unique and valuable heritage of biodiversity.

REFERENCES

- Bleisch W, Chen N. 1990. Conservation of the black-crested gibbon in China. *Oryx*. 4:147~156
- Collins A. 1988. *Rare Birds of the World ICBP Handbook*. New York: Stephen Green Press
- Conway W G. 1986. The practical difficulties and financial implications of endangered species breeding programs. *Int. Zoo yearbook* 24/25: 210
- Conway W G. 1989. The prospects for sustaining species and their evolution. In: Western D, M C Pearl (eds.) *Conservation for the Twenty-first Century* Oxford: 199~209
- De Schauensee R M. 1984. *The birds of China* Smithsonian. Washington, D C
- Diamond J. 1989. Overview of recent extinctions. In: Western D, M C Pearl, (eds.), *Conservation for the Twenty-*

first Century Oxford: 37~41

- Eudy A. 1987. Action Plan for Asian Primate Conservation. 1987~1991 IUCN/SSC Primate Specialist Group
- Gilpin M E, M E Soule. 1987. Minimum viable population: Processes of species extinction. In: Soule M E (ed.), *Conservation Biology: The Science of Scarcity and Diversity* Sunderland: 19~34
- Griffith B, J M Scott, J W Carpenter, C Reed. 1989. Translocation as a species conservation tool: Status and strategy. *Science*, 245:477~480
- Lacy R C. 1992. The effects of inbreeding on isolated populations: are minimum viable population sizes predictable? In: Fiedler P L, S K Jain (eds.), *Conservation Biology*, New York: Chapman and hall. 297~320
- MacKinnon J. 1990. Species Conservation Monitoring System: China. 1990 Revision WWF Int. : Gland
- Moyle P B, R A Leidy. 1992. Loss of biodiversity in aquatic ecosystems: evidence from fish faunas. In: Fiedler P L, S K Jain (eds.), *Conservation Biology*. New York: Chapman and Hall. 127~169
- Pearl M. 1992. Conservation of Asian primates: Aspects of genetics and behavioral ecology that predict vulnerability. In: Fiedler P L, S K Jain (eds.), *Conservation Biology* New York: Chapman and hall. 297~320
- Shi Liming. 1993. Genetic diversity and its preservation. *Chinese Biodiversity*, 1: 23~31
- World Conservation Monitoring Centre. 1990. 1990 IUCN Red List of Threatened Animals IUCN: Gland
- Xu Y C, H Q Jiang, F Quan (eds.). Xishuangbanna Ziran Baohuqu Zonghe Kaocha Baogaoji (Xishuangbanna Natural Protected Area Survey Report Summary). (in Chinese)