China is one of the countries with the richest snakes' diversity in the world. Great importance has been attached by Government of China and competent authorities to the conservation and management of snakes. In compliance with the principle of “strengthening resource protection, promoting active domestication and captive breeding, and rational exploitation and utilization” formulated in the *Wild Animal Protection Law (WAPL, 1988)*, great progresses have been made in the conservation of snake resources in the wild and the provision of snakes through captive breeding programs. As a result of the effective measures undertaken, currently the demand for snakes is largely met by sources from captive breeding facilities, a strategic transition from the traditional dependence on snakes collected from the wild. Integration of resources conservation and traditional culture and utilization considerations has been reached on the basis of sustainable development.

1. **Status of snake wild populations in China**

Snakes are found all across China. Up to date altogether 209 species of snakes has been reported, among them 54 species are endemic to China. From north to south, snakes species diversity shows a general trend of increase. In North China less than 40 species of snakes can be found in one province, while this figure rise to over 60 species a province in South China. Guangxi and Yunnan are the two provinces with the highest snake diversity in China, with nearly 100 species of snakes recorded, respectively.

Since 1950s, field surveys and research, limited in both in geographic scope and the number of species of snakes covered, have been undertaken to understand and monitor the population status and trend of snakes in the wild. Based on the information and data collected from those efforts, a general trend of decline is recognized in the population sizes of the snake species studies in the second half of the 20th century in whole China or in certain regions. For example, in Liaoning Province in northeast China, the wild population of viper (*Agkistrodon halys*) has been dramatically reduced from 10 million in 1970s to mere 3 million in 1997, and in the same time the wild population of Korean rat snake (*Elaphe anomala*) is literally decimated from 1 million to less than 100,000 snakes (Liu, 2002). Some snake species have been driven to the brink of extinction. For example, with a total wild population of only 500 individuals, the Mountain Mang pit-viper (*Zhaoermia mangshanensis*), endemic to China, is regarded as critically endangered.

From 1995 to 2003, the first national survey of terrestrial wildlife was carried out by State Forestry Administration (SFA), in which 19 species of snakes were sampled. The survey data show that all those 19 snake species surveyed experienced a decline in population size as a result of environmental pollution, habitat loss and degradation, poaching, and over-exploitation. In spite of the differences in survey methodology and subsequent limited compatibility in survey data, a trend of widespread population decline can be firmly established. It is a plain fact that many snake species, particularly those with high economic value, experienced a steady decline in the wild across the nation or at local areas from 1950s to the beginning of this century.
2. Utilization and captive breeding of snakes in China

A. General information on snake utilization

Historically snakes were used as food, in traditional Chinese medicine, and part in Chinese music instruments. In the *Shennong's Materia Medica*, the earliest Chinese medicinal book dating back to 2000 years ago, the medicinal properties of some snakes’ species were recorded. In the most renowned *Compendium of Materia Medica* (Li Shizhen, 1579), more than 10 species of snakes were described (Chen, 2000). The skin of Burmese python (*Python molurus*) is used in the manufacture of some Chinese music instruments, such as Erheen, Sanxian, and hand drum. Erheen has a history of more than 1000 years in China, while Sanxian and the hand-drum date back to more than 500 years.

The significant progress in socio-economic development and science and technology in the past 3 decades has taken a heavy toll on snake populations in China. On top of the steadily increasing demand for snakes as food, medicine, and musical instrument parts, a new market in tonic products, cosmetics, and skin products has been created and is expanding rapidly in both scope and scale, jointly taking a heavy toll on wild. Wan and Fan (1998) estimated that the total quantity of snakes used in China each year has increased from 7.5 million kg in 1993 to 9 million kg in 1997. The quantity of snake use began to drop dramatically after SFA introduced a series of control measures to ban the direct consumption of snakes as food in 2004. Since then the demand for snakes comes mainly from such sectors as Traditional Chinese Medicine, tonic production, cosmetics, skin goods and Chinese music instruments, with cobra (*Naja naja*), Oriental rat snake (*Ptyas mucosus*), hundred pace viper (*Deinagkistrodon acutus*), vipers (*Akistrodon spp.*), and narrow-banded krait (*Bungarus multicinctus*) as the most commonly used.

B. Captive breeding of snakes

To meet the increasing demand for snakes in market, some institutions began to explore the possibility of breeding and farming snakes in captivity since 1980s. In the beginning the captive breeding of snakes tested all attempts and most snake farms in fact practices a ranching operation, i.e., raising snakes collected from the wild in captivity for a short period of time before selling them in market. The only advantage of this ranching practice was that the young and small snakes could grow to marketable size, contributing to the wise use of snake resources. From the prospective of establishment of self-sustaining founder populations, farming skills and technique, management, disease control and treatment, and reproduction, it was not a real captive breeding and farming operation. Later as forestry department stepped up its efforts in the control of illegal harvesting from the wild and trade in snakes, the risk of such snake ranching operation grew so high that it ceased to be profitable and gradually phased out. At the same time, a number of snake farms kept on experimenting and finally succeeded in breeding snakes in captivity. Great breakthroughs have been made in such fields like farming of F2 young snakes and snakes for commercial purposes, feeds for newly hatched snakes, compound feeds, elimination of hibernation behavior, and development of low-cost feed. As a result, several species of snake can breed successful under captive conditions. The dramatic drop in the cost of breeding and farming of Burmese python, cobra, Oriental rat snake, King rat snake has made commercial farming feasible economically for the first time. The sizes of captive populations of some snakes species and annual yield are also quite impressive. For example, the captive population of python in DongShengHong Python Farm at Hainan Province numbers almost 60,000 animals and over 10,000 adult pythons can be supplied to market each year.

In spite of its limited success, the captive breeding/farming of snakes still have a long way to go. The breeding of many snake species in captivity remains problematic, survival rate is low, and operating cost is prohibitively high. Much work needs to be done in regard to
secured supply of founder population, stud book maintenance, disease control and treatment. Compared with market demand, the current scale of captive breeding/farming operations is far too small to relieve the huge pressure on wild snake populations.

C. International Trade in Snakes

In the past, the international trade in snakes involved mainly the exportation of traditional Chinese medicines that contain snake ingredient and Erheen, the traditional musical instruments. Since middle 1990s, with the increased demand for snake for food and snake skin goods as a result of rising standards of living and the steady dwindling of snake populations in the wild, China have to import more and more live snakes, snake skins and skin products to fill the gap. The importation of live snakes had jumped from less than 300,000 specimens in 2000 to nearly 1.5 million in 2004. The reasons for that hike included primarily shrinking snake resources at home, increase of demand for food consumption, and expansion of snake skin processing industry in China. In 2004, the forestry department imposed a series of measures to control the consumption of snakes as food in restaurants. In addition, relevant department has banned the operation of those companies that solely focused on snake skin processing in China. As a consequence, the amount of imported live snake dropped rapidly. Now, the international trades in snakes include import of live snakes, snake skin and skin products, Erheen with python skin. The most traded snake species include Burmese python, black snakes (Zaocys spp.), narrow-banded krait, rat snakes, vipers etc.

3. Conservation and Management of Snakes in China

Along with the progress of wild animal protection cause in China, the conservation and management of wild snakes receive more and more attention. The milestone Wild Animal Protection Law (WAPL) was passed in the National People's Congress of P. R. China on November 8, 1988. In the following year, Burmese python was recognized as a Category I national protected wildlife species in the List of Wild Animals under National Protection issued by the State Council. In 2009, 205 species of snakes included into the List of Nationally Protected Terrestrial Wildlife Species with Significant benefits, Economic and Scientific Values, by SFA. Furthermore, many species of snakes have been classified as local protected species by provincial legislation. Those pieces of legislation provide a legal framework for the snake conservation and management.

The following measures have been taken for the conservation and management of snakes in China.

First, permission from forest departments is required for the harvest and trade of the snake species that are included in the List of Wild Animals under National Protection and the List of Nationally Protected Terrestrial Wildlife Species With Significant benefits, Economic and Scientific Values. Furthermore, in most provinces, permission of forestry department is also required to carry out captive breeding and farming of snakes. These requirements render strict management to the harvest and trade of snakes, and overall control over the level of utilization of snake resources by forestry departments.

Second, according to regulations of the former Ministry of Forestry (now SFA), a legal status of Category I national protected species is granted to those snake species that are listed in CITES Appendix I and are classified as alien species in China, and a legal status of Category II national protected species is granted to those snake species that are listed in CITES Appendix II and are classified as alien species in China.

Third, effective measures have been taken to set up protected areas for snakes, to conduct surveys and monitoring of snake populations, and to enhance the conservation of snake wild populations and their habitat. In the forthcoming second national terrestrial
wildlife survey, 35 species of snakes will be covered to understand the status and dynamics of their wild populations.

Fourth, in the **Notification on the improvement of the regulation of snake export** issued by the former Ministry of Forestry in 1990, specific requirements were put forward for the approval procedures of exportation of snakes and their products.

Fifth, snakes were not included in the **List of terrestrial wildlife species that are eligible for captive breeding for commercial purposes** issued by SFA in 2003. In the **Guideline on the Sustainable Utilization of Wild Animals and Plants** issued by SFA in 2004, stricter regulations are provided for the general protection of wildlife resources. Specifically, the guideline prohibits or strictly controls the harvest of wildlife for the purposes of direct commercial utilization and food consumption. In compliance with the requirements of that guideline, the majority of restaurants in China have removed snakes from their menu, resulting in dramatic reduction in the amount of snakes used.

Sixth, in the **Notification on the improvement of the conservation and medicinal use of the Saiga antelope, Pangolin and Rare snakes, and their products** jointly issued by SFA, Ministry of Health, State Administration of Industry and Commerce, State Food and Drug Administration, and State Administration of Traditional Chinese Medicine Management in 2007, collection of snakes from wild is strictly prohibited. In addition it requires: 1) guidance and proper regulation over captive breeding and farming of snakes, 2) to inventory, store and on-site custody of snake products in stock; 3) to identify the scope of the use of snake products, 4) to impose an overall capping on the amount of the utilization of snakes; and 5) to adopt a specific marking system for products with snake ingredients.

Seventh, effective wildlife enforcement system has been established, with the forest police and wildlife management authorities as the principal players, assisted by other relevant departments such as Industry and Commerce Administration, and Customs office. A two-prong operation approach is adopted in which regular enforcement activities is boosted with special crack-down campaigns in response to specific needs. This wildlife enforcement system has effectively decreased the illegal harvesting and utilization of wildlife.

Finally, efforts have been taken on research on captive breeding, farming and utilization of snakes and pilot reintroduction program. Research institutions have been commissioned to undertake studies on the techniques of captive breeding and farming of snakes and the feasibility of pilot reintroduction of captive-bred snakes into their original habitats in Guangdong and Hainan provinces. Each year, tens of thousands of young king rat snakes are released into the wild in Hunan, Jiangxi and Sichuan provinces. Based on the success in the captive breeding of Burmese python, a pilot reintroduction program was officially launched by SFA and Hainan Provincial Forest Bureau in March 2011 in which 100 pythons, either captive bred or confiscated in enforcement activities, were released at YaNuDa Rainforest in Hainan Province. Those pythons are fitted with PIN chips and other monitoring devices to allow for monitoring and research of them by satellite or researcher on the ground.

In addition, China Wildlife Conservation Association (CWCA) plays an important role in conservation and sustainable use of snake resources. It has set up a special herpetology committee for that purpose, and has organized workshops and conferences to topics relevant to snake conservation and sustainable use, such as inventory, over-exploitation and captive breeding. In 2009 and 2010, two workshops on snake conservation and captive breeding/farming were held at Hainan and Hunan provinces by CWCA, respectively, to explore effective management interventions for the conservation and sustainable use of snakes.
The measures listed above have jointly provided a sound basis for the effective conservation and management of snakes in China. The amount of use of snakes is under strict control. There is breakthrough in captive breeding and farming of several species of snakes. Two strategic transitions in snake conservation have been completed, i.e., from food consumption to medicinal use, and from wild collection to captive bred. The conservation, captive breeding and rational use of snakes have been adequately integrated on the basis of sustainability.

4. Next Steps for Conservation and Management of Snakes in China

In spite of the commendable achievements in the conservation and sustainable use of snakes in the past 3 decades, major constraints remain: 1) Large majority of snake species are not included in the list of the national protected wildlife species and thus do not eligible to legal protection under the Wild Animal Protection Law. 2) Lack of reliable population information on many snake species makes the implementation of effective management interventions impossible. Scientific surveys and monitoring of wild snake populations are urgently needed. 3) Except for a few species, the captive breeding is not successful with most of the snake species, or its cost is prohibitively high. As a result, the scope of captive breeding operation of snake, in terms of number of snake species and size of captive populations, is far too small to fully meet the current market demand. The conflict between conservation and utilization remain acute.

In order to resolve these problems in China, following measure will be taken:

A. To include priority snake species into the list of national protected species so as to give them proper legal protection.

The criteria for the selection of priority snake species include: endemic to China, with small wild population size and narrow distribution (e.g. Mt. Mang pit-viper, Shedao viper, and Thermophis bailey); in endangered status (e.g. Azemiops feae and Vipera berus); and subject to over-exploitation because of commercial use (cobra, narrow-banded krait, and most species in Family Colubridae).

B. To step up efforts for the survey, monitoring and protection of the wild population and their habitats in important snake regions.

Scientific knowledge and information generated in field surveys and monitoring are needed to better understand trend and characters in snake population dynamics, to formulate proper policy and regulations on the conservation of wild snake populations and their habitats, to adopt effective intervention measures for conservation, rescuing and monitoring, and to combat illegal collection of snake from wild. Continued efforts will also be made in studies on captive breeding and farming and reintroduction in larger scale with the aim to support the recovery of snake populations in the wild.

C. To strengthen regulation of snake use and trade

The control on the overall amount of use of snakes will be applied continuously. The special marking system for snakes and their products will be multiplied in a larger scale. The communications and cooperation among wildlife enforcement departments, including forestry, police, industry and commerce administration and customs, will be promoted in order to enhance the efficiency and effectiveness of enforcement. Law enforcement staffs at the front line will be trained in the identification of snakes and their products, use of enforcement tools and techniques, and enforcement skills by those research institutions that are responsible for the development and implementation of the special marking system.
Active cooperation will be sought extensively with NGOs to raise public awareness on relevant legislation, national policies and regulations so as to create an amiable social environment in support of conservation and sustainable use of snakes.

**D. To enhance capacity of snake farms by providing guidance and technical supports.**

Technical supports will be provided to the institutions that engage in captive breeding and farming of snakes in the form of promulgation of technical criteria and training. Such technical supports are expected help the recipients solve key technical problems in snake captive breeding and farming, mainly snake provenance cultivation and management of genetic lineages, disease control and treatment, formulas for no-pollution feed and compound feed, and establishment of information management system. Consequently the performance of those institutions will be considerably improved through the drop of farming costs, higher hatchery and survival rates, decrease in mortality and disease occurrence and higher economic return. With greater demonstration efforts, snake farms will be encouraged to set up their own provenance cultivation and feed manufacturing bases, the first step to place captive breeding and farming of snakes on a scientific, standardization and large-scale foundation.

**E. To enhancing enforcement capacity through increased international cooperation and communication.**

Snakes and their products account for a certain proportion in the international wildlife trade and this proportion is subject to complex dynamics in response to socio-economic, scientific and technical factors. In order to control the impact of excessive trade on the wild populations of snakes, particularly to prevent threats to the survival of endangered snake species, it is recommended to undertake in-depth studies on the impact of international trade on wild snake populations. Based on the results of studies, possibility of adding more snake species in CITES Appendices will be elaborated in order to solicit support of the international communities for stronger snake conservation. Meanwhile, further international cooperation and communications will effectively enhance the exchange and sharing of enforcement experiences and data, conducive to better control of illegal snake trade.