The Vulnerable and Endangered Plants of Xishuangbanna Prefecture, Yunnan Province, China

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Efforts are now being taken to preserve endangered species in the rich tropical flora of China's "Kingdom of Plants and Animals"

Xishuangbanna Prefecture is a tropical area of China situated in southernmost Yunnan Province, on the border with Laos and Burma. Lying between 21°00' and 21°30' North Latitude and 99°55' and 101°15' East Longitude, the prefecture occupies 19,220 square kilometers of territory. It attracts Chinese and non-Chinese botanists alike and is known popularly as the "Kingdom of Plants and Animals." The Langchan River passes through its middle.

Xishuangbanna is very hilly, about 95 percent of its terrain being hills and low, undulating mountains that reach 500 to 1.500 meters in elevation. The highest peak is 2,400 meters in elevation. High mountains in the north, including the Wuliang and Ailao Mountains, block the cold air from the north and trap warm, humid air from the Indian Ocean, creating a hot, humid, windless tropical climate. The mean annual temperature is 18 C to 22 C, and, depending upon elevation and topography, 1,000 millimeters to 2,200 millimeters of precipitation fall annually; as a result, tropical forest and other tropical vegetation flourish on hillsides and in valleys. A great diversity of vegetation typesincluding tropical rain forest, seasonal rain forest, montane rain forest, and evergreen

broadleaf forest-occurs in Xishuangbanna. Coniferous forest develops above 1,200 meters. In addition, Xishuangbanna lies at the transitional zone between the floras of Malaya, Indo-Himalaya, and South China and therefore boasts a great number of plant species. So far, about 4,000 species of vascular plants have been identified. This means that Xishuangbanna, an area occupying only 0.22 percent of China, supports about 12 percent of the species in China's flora. The species belong to 1,471 genera in 264 families and include 262 species of ferns in 94 genera and 47 families, 25 species of gymnosperms in 12 genera and 9 families, and 3,700 species of angiosperms in 1,365 genera and 208 families.

The tropical features of Xishuangbanna's flora are quite distinct. Such tropical families as the Dipterocarpaceae, Myristicaceae, Tetramelaceae, Anonaceae, and Dilleniaceae, and such genera as *Ficus*, *Artocarpus*, *Antiaris*, *Dysoxylum*, and *Aphanamixis* are represented. About 60 percent of the species in Xishuangbanna's flora also occur in Vietnam, Laos, Burma, and India. During the past two centuries, many species from the Indochinese peninsula and other tropical regions have been successfully introduced into Xishuangbanna. Among them have been *Cassia siamea*, *Mesua ferrea*, *Crinum asiaticum*, *Cananga odorata*, and *Bixa orellana*.

There are many endemic species in Xishuangbanna's flora, such as *Manglietia* wangii, Polyalthia cheliensis, Phœbe puwen-

Cycas pectinata Griffith, a rare and vulnerable species. It is a spectacular ornamental plant, and its fruit and stem are used in medicine by the Dai minority of China. Photographs by the author.

sis, and Horsfieldia tetratepala; a number of relict species, such as Cycas pectinata, Podocarpus wallichii, Magnolia henryi, and Sladenia celastrifolia; and many rare species, such as Manglietia fordiana, Michelia hedyosperma, Paramichelia baillonii, and Pseuduvaria indochinensis. According to data collected by Li Yanhui, 153 endemic species, 31 relict species, and 133 rare species grow in Xishuangbanna; of them, 110 are endangered or vulnerable (see the list on pages 6 and 7).

Twenty-eight wild types of cultivated plant species and their relatives occur in Xishuangbanna's flora, among them Oryza minuta, Camellia sinensis var. assamica, Coix lacryma-jobi, Citrus grandis, and Momordica subangulata. Some may prove to have significant value in genetic research and breeding.

More than 1,000 species in Xishuangbanna's flora are economically important. About 500 of them are medicinal plants that are used locally or in traditional Chinese medicine; among these are Amomum villosum, Taraktogenos merrillana, Cissampelos paraira var. hirsuta, and Homalomena occulta. Rauvolfia yunnanensis has become an important source of reserpine, and Maytenus hookeri is alleged to have anti-cancer properties.

More than 100 species of tree in Xishuangbanna's flora grow fast or produce high-quality timbers, the best example being *Dalbergia fusca* var. *enneandra*, which has purple-black heartwood. Its wood is very hard, heavy, and tough and so is used as a substitute for rosewood. The fast-growing species *Anthocephalus chinensis* is another example. It is the most productive timber tree in tropical tree plantations. *Toona ciliata*, *Paramichelia baillonii*, *Gmelina arborea*, *Altingia excelsa*, *Chukrassia tabularia* var. *velutina*, and *Dysoxylum bineceæfolium* are all valuable hardwood timber trees that are used in industry and construction.

Xishuangbanna's flora contains more than 100 oil-bearing species. Horsfieldia tetratepala, Jatropha cureas, Hodgsonia macrocarpa, Ostodes katharinæ, and Pyrularia edulis, for example, are important sources of food oil or industrial oil. Ten species—Calamus flagellum, Calamus palustris, Calamus nambariensis, etc.—yield rattan. Many species are aromatic, tanning, or resin and gum plants, among them Elsholtzia blanda, Cinnamomum mollifolium, Phyllanthus emblica, and Sterculia villosa.

During the past 20 years, many forests in Xishuangbanna were ruined. More than 13,000 hectares of forest were cut each year as a result of shifting cultivation, conversion to rubber plantations, and demands for timber and fuel by local people. Recently, the forest cover of Xishuangbanna has declined sharply, from about 60 percent to 33 percent. Many hillsides that once were covered with rain forests are now grassland of cogongrass and low shrub. Along with the destruction of tropical forests, obviously, many plant and animal species have been threatened. It is estimated that one species is lost for every 700 hectares of tropical forest ruined. If this is so, then more than 800 species of plant have been lost or are in danger of being lost. If remedial measures are not taken today, many species with valuable properties will be lost. This would be a big mistake, one that our descendents would be unlikely to forgive.

The first volume of the *Plant Red Data Book for China*, recently issued by the Academia Sinica (the Chinese Academy of Science), lists 389 endangered species of Chinese plants. The *Book* gives their morphological features, distributions, and statuses and describes methods for their conservation. Fiftyfour of the species it lists are native to Xishuangbanna.

The Chinese government devotes more attention to nature conservation now than it once did. For example, 310 nature reserves, with a total area of 167,000 square kilometers, have been established throughout the country, and the funding of nature-conservation programs has been increased. In Xishuangbanna Prefecture, some 600,000 hectares of tropical forest survive. To protect remaining ecosystems and species, 200,000 hectares of land (about one tenth the prefecture's area) have been set aside as reserves, including the Mengyang, Mengla, Menglun, Menghai, and Dashujiao reserves, and a team of 150 forest guards has been organized. The guards patrol forests, prevent forest fires, stop hunting and timbering within nature reserves, and deal with criminal cases of vandalism.

The Yunnan Institute of Tropical Botany, Academia Sinica—formerly the Botanical Garden of Xishuangbanna—is located in the prefecture. It is has become an active center



Caryota urens Linnæus, the wine (or sago) palm, is an endangered species in China. The Dai minority use the tasty starch in the middle of the trunk for food.

for the study and conservation of tropical plants. More than 2,500 local and otherwise tropical plant species, including dozens of endangered species, have been introduced and cultivated there.

Xishuangbanna is a treasure house of natural resources. Its flora, one of the richest in China or for that matter in the world, contains many rare, endemic, and economically valuable species. A veritable treasury for our well-being, it has suffered seriously in the past. We must now work hard to prevent further losses to it.

Vulnerable and endangered members of Xishuangbanna's flora

(The symbols indicate that a species is vulnerable (*) or endangered (\mathfrak{E}); species listed as endangered in the *Plant Red Data Book for China* are printed in boldface type.

Relict species

- * Alsophila spinulosa (Wallich ex Hooker) Tryon
- * Cycas pectinata Griffith
- * Anchangiopteris henryi Christ & Giesenhagen
- * Cycas siamensis Miquel
- * Podocarpus imbricata Blume
- *℃Podocarpus wallichii* Presl
- €Podocarpus fleuryi Hickel
- * Podocarpus nerrifolia Wight
- Cephalotaxus oliveri Masters Magnolia henryi Dunn
- * Sladenia celastrifolia Kurz
- * Cenocentrum tonkinense Gagnepain
- Borthwickia trifoliata W. W. Smith
- * Silvianthus bracteata Hooker fils
- * Pittosporopsis kerrii Craib
- * Cephalostigma hookeri C. B. Clarke
- * Campanumœa parviflora (Wallich) Bentham
- € Zippelia begoniæfolia Blume

Endemic species

- * Manglietia wangii Hu
- * Manglietia microgyna Liou
- Magnolia delavayi Franchet var. albivillosa Liou
- Cyathocalyx yunnanensis Y. H. Li & P. T. Li
- €Cyathostemma yunnanensis Hu
- * Desmos yunnanensis (Hu) P. T. Li
- Coniothalamus chinensis Hu
- Cinnamomum austroyunnanensis H. W. Li

- * Cinnamomum mollifolium H. W. Li Litsea dilleniæfolia P. Y. Bai & P. H. Huang
- Neolitsea menglaensis Yang & P. H. Huang
- * Horsfieldia pandurifolia Hu
- €Horsfieldia tetratepala C. Y. Wu
- * Myristica yunnanensis Y. H. Li
- €Anemone filisecta Wu & Wang
- Capparis fohaiensis B. S. Sun
- 𝒞Xanthophyllum yunnanensis C. Y. Wu
- * Heliciopsis lobata (Merrill) Slaum var. microcarpa C. Y. Wu & T. Z. Hsu Heliciopsis terminalis (Kurz) Sleumer Homalium laoticum Gagn. var. glabretum C. Y. Wu
- * Parashorea chinensis Wang Hsie
- € Pellacalyx yunnanensis Hu
- Camellia taheishangensis F. S. Zhang
- & Garcinia lancilimba C. Y. Wu ex Y. H. Li
- €Garcinia xishuangbannaensis Y. H. Li
- Cchrocarpus yunnanensis H. L. Li
- €Grewia falcata C. Y. Wu
- Sloanea cheliensis Hu
- € Pterospermum yunnanensis Hsue
- €Pterospermum mengluensis Hsue
- * Ostodes kuangii Y. T. Chang
- * Sauropus coriaceus C. Y. Wu
- * Lithocarpus yiwuensis Huang & Y. T. Chang
- * Maytenus diversicymosa S. J. Pei & Y. H. Li
- * Maytenus pseudoracemosa S. J. Pei & Y. H. Li
- €Maytenus inflata S. J. Pei & Y. H. Li
- €Maytenus pachycarpa S. J. Pei & Y. H. Li

- Protium yunnanensis (Hu) Kalkm.
- * Amoora calcicola C. Y. Wu & H. Li
- * Walsura yunnanensis C. Y. Wu
- Buchanania yunnanensis C. Y. Wu
- * Mastixia caudatilimba C. Y. Wu
- Nyssa sinensis Oliv. var. oblongifolia Fang & Soong
- Nyssa yunnanensis W. C. Yin
- Cospyros atrotricha H. W. Li
- Marsdenia incisa P. T. Li & Y. H. Li
- * Kopsia officinalis Tsiang & P. T. Li
- * Radermachera microcolyx C. Y. Wu & W. C. Yin
- Callicarpa yunnanensis W. Z. Fang
- * Salvia fragarioides C. Y. Wu
- * Arisæma austroyunnanensis H. Li
- * Achasma yunnanensis T. L. Wu & Senjen

Rare species

- * Manglietia fordiana Oliver
- Michelia hedyosperma Law
- €Mitrephora wangii Hu
- * Litsea magnolifolia Yang & P. H. Huang Litsea pierrei Lecomte var. szemaois Liou
- * Machilus rufipes H. W. Li
- Knema cinerea Warburg var. glauca Y. H. Li
- Horsfieldia kingii (Hooker fils) Warburg Fleutharrhane macrocarpa (Diels) Formanék
- Piper pubicatulum C. de Candolle
- Argemone mexicana Linnæus
- **₹Lagerstræmia** intermedia Koehne
- € Crypteronia paniculata Blume
- Cochlospermum vitifolium Sprengel
- * Aquilaria sinensis (Loureiro) Gilg
- Zanonia indica Linnæus Tetrameles nudiflora R. Brown Terminalia myriocarpa Heurck & Müller Argoviensis

Anogeissus acuminata (Roxburgh ex de Candolle) Guillaumin var. *lanceolata* Wallich ex Clarke

- €Quisqualis caudata Craib
- Combretum olivæforme Chao Carallia lancæfolia Roxburgh
- * Calophyllum polyanthum Wallich ex Choisy Mesua nagassarium (Burman fils) Kostermans
- Colona sinica Hu
- Vilson Sloanea tomentosa (Bentham) Rehder &
- Pterygota alata (Roxburgh) R. Brown
- * Vatica xishuangbannaensis G. D. Tao & J. H. Zhang
- *Pterospermum acerifolium Willdenow
- * Bombax insignis Wallich

- * Hibiscus austroyunnanensis C. Y. Wu & K. M. Feng
- * Erythroxylum kunthianum (Wallich) Kurz Ixonanthes cochinchinensis Pierre
- Chætocarpus castanocarpus Thwaites Dalbergia fusca Pierre
- * Whitfordiodendron filipes (S. T. Dunn) S. T. Dunn
- Distilopsis yunnanensis (H. T. Chang) C. Y. Wu
- * Cyclobalanopsis rex (Hemsley) Schott
- * Trigonobalanus doichangensis (A. Camus) Formanék
- * Celtis wightii Planchon
- * Antiaris toxicaria (Persoon) Leschenault Artocarpus lakocha Roxburgh Laportea urentissima Gagnepain Poikilospermum suaveolens (Blume) Merrill
- * Maytenus hookeri Loesener
- * Garuga pierrei Guillaumin Toona ciliata Roemer
- * Toona microcarpa (de Candolle) Harms Xerospermum bonii (Lecomte) Radlkofer Pometia tomentosa (Blume) Teysmann & Binnendijk
- *Nyctocalos shanica MacGregor & W. W. Smith
- Gmelina arborea Roxburgh
- * Homalomena gigantea Engler
- * Tacca chantrieri André
- * Caryota urens Linnæus

Wild types of cultivated plants Oryza meyeriana (Zollinger & Moritz) Baillon var. granulata Tataoka Oryza minuta J. Presl Camellia sinensis (Linnæus) O. Kuntze var. assamica (Masters) Kitamura Litchi chinensis Sonnerat Citrus grandis Osbeck Mangifera sylvatica Roxburgh

Cucumis hystrix Chakrav. Panax zingiberensis C. Y. Wu & Feng ex C. Chow Howenia coerba Lindley van kinki angensis

Hovenia acerba Lindley var. kiukiangensis (Cheng & Hu) C. Y. Yu

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