

Annual Report 2015



**Xishuangbanna Tropical Botanical Garden
Chinese Academy of Sciences**



Cover photos, anti-clockwise:

1. *Prunus kunmingensis* T. Su, P. Wilf et Z.K. Zhou, (a–e) KUN PC2015001-KUN PC2015005. (f) CT scan showing longitudinal section and seed (P. 11);
2. 2015 Annual Conference of Chinese Botanic Gardens (P. 25);
3. UK Prince William visited XTBG (P. 55);
4. The launching ceremony of the renovation program of CAS-SEABRI (P. 5);
5. The international "Fascination of Plants Day 2015" (P. 38);
6. XTBG researchers assessed the current status of all orchid species in Xishuangbanna (P. 9);
7. Ecologists and conservation biologists change thinking by Anthropocene concept (P. 9).



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March 29, 2016



Xishuangbanna Tropical Botanical Garden (XTBG), Chinese Academy of Sciences is a non-profit, comprehensive botanical garden involved in scientific research, plant diversity conservation and public science education, affiliated directly to the Chinese Academy of Sciences.

XTBG's vision:

Desirable base for plant diversity conservation and ecological studies.
Noah's Ark for tropical plants.

XTBG's mission:

Promote science development and environmental conservation through implementing scientific research on ecology and plant diversity conservation, horticultural exhibition, and public education.



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A close-up photograph of a ginger flower spike. The spike is composed of many small, tubular flowers arranged in a vertical column. The flowers at the base are in full bloom, showing a mix of pink and white petals with prominent pink veins. A small, dark bee is perched on one of these lower blossoms. Above the open flowers, the spike continues with a series of unopened buds, which are a pale yellowish-green color. The top of the spike is a sharp, pointed red. The background is a soft-focus green, suggesting foliage.

Science

Photo by DUAN Qi-Wu

In 2015, XTBG received 49.52 million Yuan in research funds from

70 new projects:

18 projects funded by the National Natural Science Foundation of China;

7 projects funded by Yunnan Provincial Fund for Natural Sciences;

3 projects funded by CAS “President’s International Fellowship Initiative” projects;

5 projects supported by other CAS program (including 2 STS projects);

8 projects funded by the CAS “Light in Western China” program;

29 projects funded by local government, enterprises and international agencies.

In 2015, XTBG researchers have achieved the following:

204 research articles published on internationally peer-reviewed scientific journals (Source Journals of ISI Web of Science);

5 published monographs;

7 patented inventions;

1 registration of Computer Software Copyright.

Project Development

“One Major Orientation, Three Significant Breakthroughs and Five Important Fostering Directions” project

“One Major Orientation, Three Significant Breakthroughs and Five Important Fostering Directions” project (shortened to “1-3-5”) was launched in 2012, and 2015 was the final year of implementing the project. Remarkable achievements have been accomplished.

Significant breakthroughs have been made. By the end of 2015, XTBG has successfully promoted the planting of *Plukenetia volubilis* for more than 5,733 hectares in Yunnan, Laos, Myanmar and some other places, authorized 10 core technological patents, more than 20 products have been put into market, and technical training sessions of planting for local farmers have been provided. More than 6,000 hectares of “Environmental-friendly rubber plantation” was built by cooperating with local enterprises, and promoted the friendly plantation mode to the province wide.

For the Five Directions, prominent progress also has been made. The Direction One team has conducted research on the effect of global change to the forest ecosystem, more than 60 research papers have been published on SCI journals. The Direction Two team has collected 63 species of medicinal plants, established more than 4 hectares of planting base, 6,010 plants of medicinal seedlings have been breed, and formed a comprehensive system of “traditional ethno medicine- medicine collection- active substance screening- potency

research- clinical study”. The Direction Three team has initiated the “Zero Extinction” plan and “Full-cover Conservation Plan of Native Plant Species in China”, which has had widespread impacts

across society. The Direction Four team’s research results have been granted Yunnan Provincial Natural Science Award; while the Direction Five team has carried out environmental education training courses which opened to botanical gardens and other relative institutions nationwide. The success of the “1-3-5” project is also indicated by numerous of research findings have been published in the top journals, such as *Plant Cell*, *Ecology*, *Ecology Letters*, *Global Ecology & Biogeography*, etc.

Through the carrying out of the “1-3-5” project, XTBG has brought different research directions together, successfully using a focused strength to promote the development of XTBG.



Intercropping of rubbers and Flemingia macrophylla.



XTBG scientists join the promotion meeting of Xishuangbanna Prefecture eco tea garden and eco rubber plantation construction.



“Chinese Academy of Sciences—Southeast Asia Biodiversity Research Institute” project

“Chinese Academy of Sciences-Southeast Asia Biodiversity Research Institute” project (CAS-SEABRI) was launched as a pre-research program in 2014, progress has been made in 2015.

On 19th January, the Experts Committee, which was organized by Bureau of International Cooperation, CAS, agreed the program plans of establishing the CAS-SEABRI.

On 25th August, XTBG and Forest Research Institute of Myanmar (FRI) held the launching ceremony of the



Experts Committee meeting.



Inauguration ceremony of the building renovation works.



The launch meeting in Kunming.

renovation program of CAS-SEABRI in Nay Pyi Taw. Dr. Nyi Nyi Kyaw, director general of Forest Department (FD), Ministry of Environmental Conservation and Forestry (MOECAF), Myanmar, led around 30 Myanmar delegates attended the ceremony. Academician ZHANG Ya-Ping, vice president of CAS was present at the inauguration ceremony of the building renovation works of CAS-SEABRI based in Myanmar.

Mr. Nyi Nyi Kyaw and Prof. CHEN Jin delivered opening remarks. On 27th August, the first council and academic board of CAS-SEABRI were also established in Kunming.

Between 20th and 24th October, Mr. LI Hong-Wei, deputy director of XTBG, visited FRI and checked the renovation progress of CAS-SEABRI. LI Hong-Wei called a meeting to discuss the current difficulties of renovation project progress, emphasized the principle of “safety and quality come first”.

Under the invitation of Myanmar Nature and Wildlife Conservation Division, Forest Department, Prof. QUAN Rui-Chang led delegates from XTBG, Kunming Institute of Zoology (KIZ), Kunming Institute of Botany (KIB) and Myanmar FRI conducted biodiversity field survey in Hponkanrazi Wildlife Sanctuary, Putao Township, Kachin State in Myanmar from 28th November, 2015 to 9th January, 2016.



Mr. LI Hong-Wei was inspecting the construction site.



Group photo of XTBG and FRI.



Group photo of the biodiversity field survey in North Myanmar.

“Full-cover conservation plan of native plant species in China” project

Since the launch of the “Full-cover conservation plan of native plant species in China” in 2014 by the Chinese Union of Botanical Gardens (CUBG), a great deal of progress has been made.

At the mid-term assessment of the program on February 9, the participants reported their progress. They have assessed the status of endangered and threatened plant species in their respective regions and carried out field surveys based on the assessment inventory. The participating 8 botanical gardens are on the way of achieving full coverage of native plant species conservation in their regions respectively. 70 CUBG member gardens have conducted evaluations of 36,015 indigenous



Positions of eight pilot botanical gardens.



Fieldwork in Tibet and Sichuan.



CCTV reports the project.

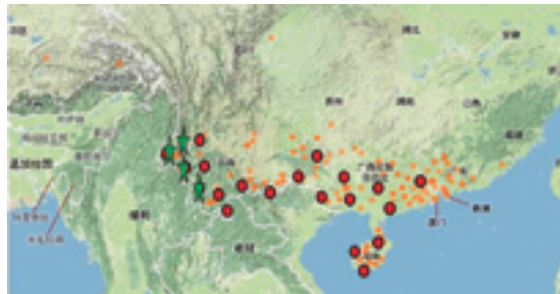
plant species or species from different provinces in China and preservation measures such as relocation, seed banks and protection zones have been taken for endangered species. The inventory was worked out by following the protocol made by XTBG: 55 species are extinct in the wild (EW), 518 species are critically endangered (CR), 1,228 species are endangered (EN), and 3,943 species are vulnerable (VU), 22,737 species are least concern (LC) and 8,358 species are data deficient (DD).

The project is aimed to explore effective ways for protecting plant species in China, and improve capacity of botanical gardens to conserve native plant resources. After finishing the implementation of “Full-cover conservation plan of native plant species in China”, a book entitled “*List of Chinese Native Plant Species*” is expected to be published. The project has attracted much social attention, CCTV has reported the project.



“The geographic mosaic effect and its evolutionary implication for fig and fig wasp coevolution” project

“The geographic mosaic effect and its evolutionary implication for fig and fig wasp coevolution” project went smoothly in 2015. Following the concept of the geographic mosaic theory of coevolution (GMTC), the project conductors took two morphological *Ficus semicordata* varieties (FSS and FSM) and their pollinating wasps as materials, field sampling from four sites was done in the southwest Yunnan from April to June. Morphological traits of fig syconia samples of 567 fig trees and



Sampling sites of GMTC project.

1,632 fig wasp crops, molecular samples of 240 fig trees and 133 fig wasps crops, and volatiles signal samples of 76 fig trees were collected. Lab work on genetic structure, morphological traits measurement and volatiles chemical analysis are still ongoing.

“Reproductive strategies and evolutionary adaptation of *Primula* in SW China” project

“Reproductive strategies and evolutionary adaptation of *Primula* in SW China” project (joint funds of the National Natural Science Foundation of China and Yunnan Provincial Government) was launched in 2013. In 2015, this project went smoothly.

Reproductive
biology of



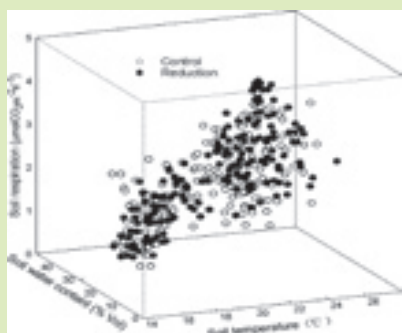
P. secundiflora-dominated alpine meadow and its pollinators.

several selected species, mainly including *Primul achungensis* (Homostyly and heterostyly), *P. oreodoxa* (Homostyly and heterostyly), *P. atrodentata*, *P. alpicola*, *P. secundiflora*, and *P. poissonii* have been continually studied in Southeast Tibet Ecologic Station (CAS), Potatso National Park, and Emei Mountains. ITS and chloroplast DNA markers of *P. achungensis* and *P. cockburniana* were sequenced to study biogeography of the sister group. Specimen data of this genus was collected to study how climate changes affect phenology. Research papers based on this project have been published in many international journals.

“Response of Yunnan’s typical forests to climate change” project

The project of “Response of Yunnan’s typical forests to climate change” is a four- year- project which was first launched in 2013. In 2015, the researchers have conducted experiments and fieldwork in four ecosystem environments: tropical rain forest in Xishuangbanna, subtropical evergreen broad-leaf forest in Ailao Mountains, savanna shrub & grass in Yuanjiang dry- hot valley, and subalpine forest in Lijiang. Markedly research progress has been achieved. A drought stress experiment was conducted in tropical rainforest. Soil respiration and environmental

parameters were measured monthly for three years. The continuous precipitation reduction treatment did not affect the seasonal patterns of soil respiration, but it significantly increased soil respiration in the study plot during the rainy season, and the relationship between soil respiration and soil moisture differed in the control and reduction treatment in the rainy season. The study indicates that the responses of soil respiration to precipitation decrease may vary seasonally and the variation of volumetric water content in different seasons may be an important factor leading to the seasonal variation. Soil warming experiment was conducted in the subtropical forest. The results showed that the decrease of warming effect on heterotrophic respiration was not caused by acclimation to the warmer temperature, but was instead due to decrease of warming effect on soil temperature. Several research papers based on this project have been published in *Plant and Soil* and other international journals.



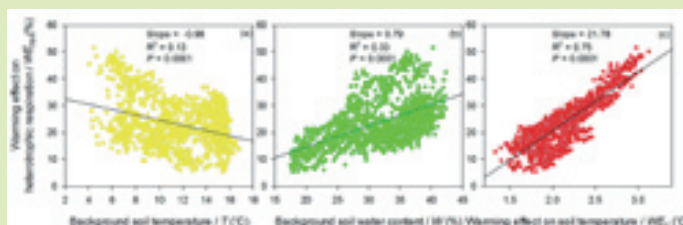
The relationship between soil respiration and soil moisture differed in the control and reduction treatment.



Drought stress experiment in the tropical rainforest.



Soil warming experiment in the subtropical forest.



Warming effect on heterotrophic respiration.

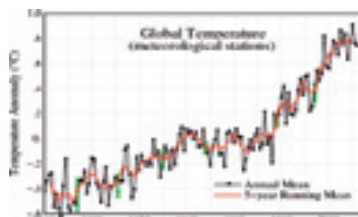


Research Progress and Outreach Highlights

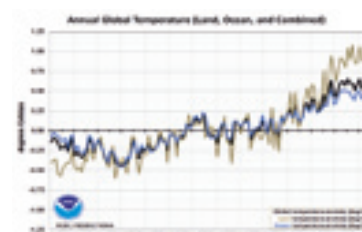
Ecologists and conservation biologists change thinking by Anthropocene concept

The geological period that we are currently in is called the Holocene, and has so far lasted for 11,700 years, since the end of the last ice age. However, many environmental parameters are now outside their Holocene ranges, including greenhouse gas concentrations, ocean acidity, the global nitrogen cycle, extinction rates, and the spread of invasive species. By consulting a large amount of literature, Prof. Richard CORLETT of XTBG looked at the impact of the Anthropocene concept on ecology and conservation biology, and assessed the likely consequences of formalization.

In ecology, the Anthropocene concept has focused attention on human-dominated



Global temperature rise.



NOAA 1880-2014 annual global temperature - land sea and combined.

habitats and novel ecosystems, and there has been considerable debate about the consequences of abandoning the steady-state assumptions that have previously underpinned ecological theory. The researcher concluded that the Anthropocene concept has been a useful shorthand for anthropogenic global change and suggested that a post-1945 start date would be most appropriate for ecology and conservation.

The study entitled “The Anthropocene concept in ecology and conservation” has been published in *Trends in Ecology & Evolution*.

Conserving orchids in Xishuangbanna

Based on data from a 3-year field survey, Prof. GAO Jiang-Yun and his team of XTBG assessed the current status of all orchid species in Xishuangbanna, analyzed the distribution of orchid species richness relative to habitat and elevation, and identified the major threats to orchids in Xishuangbanna. They identified 426 orchid species in 115 genera, and found 65 species in 36 genera new to Xishuangbanna, including 2 genera and 4 species new to China. The number of species recorded in Xishuangbanna increased from 335 species in 96 genera to 426 species in 115 genera, despite massive deforestation in the last 20 years. Orchid species richness was highest at elevation of 1000-2000m. Three species were evaluated as possibly extinct in the wild, 15 as critically endangered, 82 as endangered, 124 as vulnerable, 186 as least concern, and 16 as data deficient. Over-collection was the major threat to orchids, and



Aerides flabellat.

utility values such as medicinal or ornamental value were significantly related to endangerment. Rubber

plantations were less of threat to orchids than to other plant species.

The study entitled “Orchid conservation in the biodiversity hotspot of southwestern China” has been published in *Conservation Biology*.

Alpine ginger studies

Cautleya and *Roscoea* are two high-elevation genera in ginger family distributed in the Pan-Himalaya, with different species richness and geographic distribution.

Prof. LI Qing-Jun and his team studied gingers in the Nepalese Himalayas for four consecutive years. The researchers reconstructed the biogeography of *Cautleya* and *Roscoea* through fossil-calibrated phylogeny. Ancestral area reconstructions indicated that *Roscoea* originated in the Himalayan region and then expanded its ranges to occupy both HIM to NIC. Their results indicated that the common ancestor of *Cautleya* and *Roscoea* originated at around 44 million years ago (Ma), and divergence between *Cautleya* and *Roscoea* occurred at around 32 Ma. The results also indicated that herbaceous species with the reduced ability for long-distance seed dispersal and restricted pollen flow may harbor unique genetic imprints that reflect ancient geological and environmental changes in this region. This research is the first case that mirrored continuous geological events using one plant group in the world. Their study entitled “Evolutionary diversification of alpine ginger reflects the early uplift of the Himalayan-Tibetan Plateau and rapid extrusion of Indochina” has been published in *Gondwana Research*.

Prof. LI Qing-Jun and his team also aimed to find the effective pollinator of *R. purpurea* at the center of evolution of *Roscoea*.

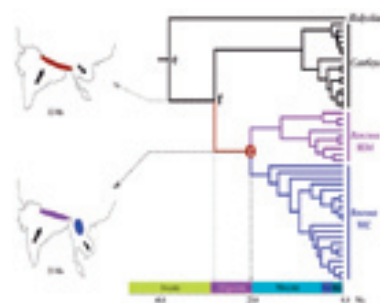


Flower and fruit of *Roscoea* (A, C) and *Cautleya* (B, D).

The study found that the partnership between *R. purpurea* and *P. longirostris* was an extremely obligate win-win situation in which plant gets reliable pollination service while fly gets secure reward. The results showed that *R. purpurea* was not capable of autonomous self-pollination and apomixis, and completely relied on pollinators for pollination success. The natural fruit set in *R. purpurea* was severely affected by pollen limitation, but seed set had no effect of pollen limitation. The study entitled “Out of Africa: evidence of the obligate mutualism between long corolla tubed plant and long tongued fly in the Himalayas” has been featured as cover story of *Ecology and Evolution* in November.



Himalayan endemic long corolla tubed alpine ginger, *Roscoea purpurea* and its obligate pollinator.



Consistency between plate movement and evolution of *Roscoea* and *Cautleya*.



Cycad species vary in leaf physiology and structure

Cycads are considered as living fossils because of the morphological similarity between fossil and extant species. It is not well-known whether cycad leaves show strong variation in physiology.

Dr. ZHANG Yong-Jiang and his colleagues of XTBG conducted a study to test whether cycad leaves are governed by the same fundamental design principles previously established for ferns, conifers and angiosperms. The study found that the cycad species varied strongly in leaf gross morphology and shape, as well as in photosynthetic rate, and stomata and hydraulic conductance. Cycad species also varied strongly in nutrient concentrations and leaf mass per area. The researchers concluded that the



Different leaves of cycad.

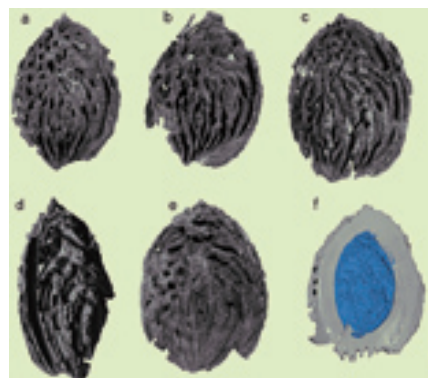


Cycad.

relationships among cycad leaf functional traits generally agreed with the global economic spectrum. High hydraulic conductance and photosynthetic rate, as well as high diversification in leaf structure and function would have facilitated their dominance in a variety of ecosystems. The study entitled “Extending the generality of leaf economic design principles in the cycads, an ancient lineage” has been published in *New Phytologist*.

Oldest peach fossil found in Yunnan

China has a long history of *Prunus persica* (peach) cultivation known from both historical and archaeological evidence. The origins of the peach and its unique features remain unknown. Prof. ZHOU Zhe-Kun’s team of XTBG discovered the oldest fossil peaches in Kunming, which provided important evidence for the origins and evolution of the modern fruit. The well-preserved fossil endocarps showed no differences from the living peach. The well-preserved specimens comprised the earliest record of peach, from the late Pliocene (i.e., by ca. 2.6 million years ago), as well as the only occurrence that predated archaeological evidence. *Prunus kunmingensis* demonstrated the early presence of peach in southwestern China and dramatically increased the region’s established significance for the evolutionary origins and cultivation history of the fruit. The study entitled “Peaches Preceded Humans: Fossil Evidence from SW China” has been published in *Scientific Reports*.

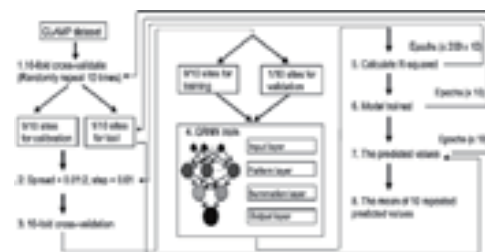


Prunus kunmingensis T. Su, P. Wilf et Z.K. Zhou, (a–e) KUN PC2015001-KUN PC2015005. (f) CT scan showing longitudinal section and seed.

Research on ancient climate, vegetation dynamics and physiognomy

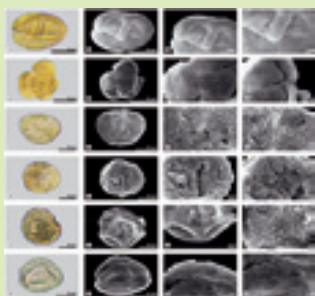
There is a relationship linking climate and physiology independent of taxonomic composition. Prof. ZHOU Zhe-Kun and his team of XTBG conducted a study to explore a different way of revealing the information content of physiognomic space. They explored a new non-linear approach to approximate the function linking climate and physiognomy. The study found that the new algorithm (CLANN) revealed a high-resolution climatic signal in leaf form. Tests showed that the predictions were repeatable, and robust to information loss and applicable to fossil leaf data. The study entitled “Artificial neural networks reveal a high-resolution climatic signal in leaf physiognomy” has been published in *Palaeogeography, Palaeoclimatology, Palaeoecology*.

Prof. ZHOU and his team also conducted a study to better understand vegetation dynamics and the Asian monsoonal climate in the Neogene. They reconstructed the vegetational succession and climate of Wenshan basin in southwestern China during the late Miocene. The study showed that temperatures differed slightly from region to region and, overall, annual and seasonal precipitation levels were higher in the late Miocene than at present, but with a weaker monsoon intensity than in the Wenshan basin today. The study entitled “Late Miocene

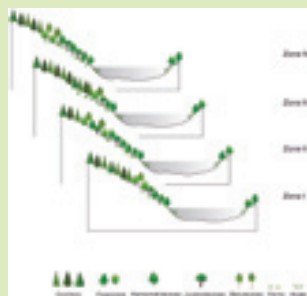


Process of CLANN.

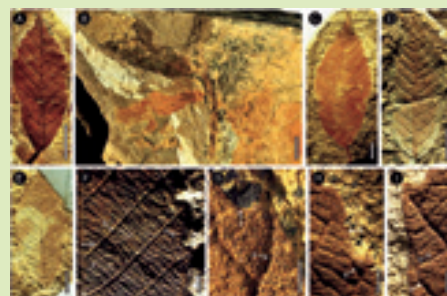
vegetation dynamics under monsoonal climate in southwestern China” has been published in *Palaeogeography, Palaeoclimatology, Palaeoecology*. Dr. SU Tao and his colleagues found that Quaternary climate change did not cause extensive extinction of insect herbivores in HET forests. The accumulation of a more diverse herbivore fauna over time supports the view of plant species as evolutionary “islands” for colonization and turnover of insect species. This study entitled “Resilience of plant-insect interactions in an oak lineage through Quaternary climate change” has been published in *Paleobiology*.



Photos of fossil pollen from Wenshan sediments.



Reconstruction of vegetation and succession history in Wenshan.



Quercus tibetensis H. Xu, T. Su et Z.K. Zhou sp. nov. from the late Miocene of Tibet.



Nutrient resorption relates to arrangement of leaf veins and growth of dipterocarp species

Dr. ZHANG Jiao-Lin and his colleagues of XTBG compared the nutrient resorption of 17 dipterocarp tree species. They regressed the nitrogen (N) and phosphorus (P) resorption efficiencies against a suite of traits associated with leaf vein density, the leaf economics spectrum and species growth performance. The study provides evidence that N resorption of the dipterocarp species is linked

to leaf vein density, and that it is closely associated with leaf nutrient conservation traits such as leaf mass per area and leaf thickness. There are significant correlations between growth rates and green leaf N concentration. These results suggest that growth rates of the dipterocarps are more likely governed by photosynthetic rates associated with green leaf N concentration than N resorption rates.

The study entitled “Nutrient resorption is associated with leaf vein density and growth performance of dipterocarp tree species” has been published in *Journal of Ecology*.

Lianas maintain better water status than trees

Lianas are an abundant and diverse polyphyletic group of plants that contribute substantially to the floristic, structural, and functional diversity of tropical forests.

Dr. CHEN Ya-Jun of XTBG and his collaborators conducted a research in liana-rich Xishuangbanna to test the water-use depth in lianas and co-occurring trees across forests that differ in water availability. Their study showed that both lianas and trees in the dry season switched to uptake water from deep soil layers in forests with severe seasonal soil water deficits. However, lianas were able to utilize a higher proportion of deep soil water than co-occurring trees. The results suggested that lianas are adapted to seasonal

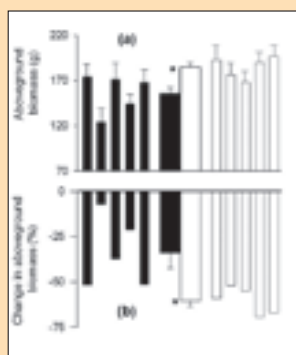


Tropical woody vines and co-occurring trees.

water deficit and thus the increase in drought conditions may explain increasing liana abundance in tropical forests. The study entitled “Water-use advantage for lianas over trees in tropical seasonal forests” has been published in *New Phytologist*.

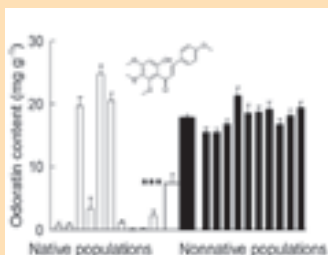
Compatibility of invasive plants depends on competitors

Alien invasive plants are usually considered to evolve to be more competitive than native conspecifics. The evolution of increased competitive ability (EICA) hypothesis and novel weapons hypothesis (NWH) are two important theories to explain the increase of competitive ability through evolutionary perspective. Dr. ZHENG Yu-Long of XTBG and his colleagues investigated the importance of integrating the EICA hypothesis and the NWH in the context of invasion by *C. odorata*. They found invasive populations of *C. odorata* were more competitive than native populations either with or without enemy exclusion in common conditions. The study suggested that invasive plant species may evolve increased competitive ability after being introduced by increasing the production of novel allele-chemicals, potentially in response to native competitors and new enemy regimes. It also indicated that the invasion process is very complicated, and multiple factors may together affect the evolution of alien plants. The



Changes in aboveground biomass of *Ageratina adenophora* plants from the native (closed bars) and invasive (open bars) populations.

study entitled “Integrating novel chemical weapons and evolutionarily increased competitive ability in success of a tropical invader” has been published in *New Phytologist*. Moreover, to test the effects of competitor identity, Dr. ZHENG Yu-Long and his collaborators set a series of competitive conditions in one common garden in Mexico: *Ageratina adenophora* plants from both native and invasive ranges competed directly, and competed with native residents from both invasive (China) and native (Mexico) ranges respectively. The results showed that invasive *A. adenophora* plants were more competitive than their conspecifics from native populations when competing with natives from China, but not when competing with natives from Mexico. However, invasive *A. adenophora* plants showed lower competitive ability when competing with conspecifics from native populations (intraspecific competition). The study entitled “Are invasive plants more competitive than native conspecifics? Patterns vary with competitors” has been published in *Scientific Reports*.



Odoratin (*Eupatorium*) contents of *C. odorata* plants from native (open bars) and nonnative (closed bars) populations grown in a common garden in China.

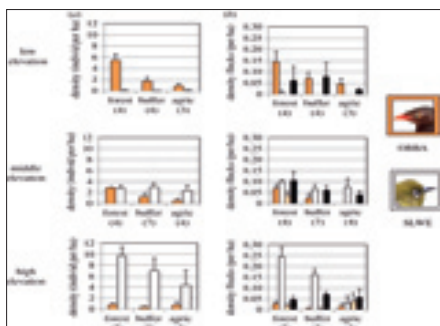


Allelopathic effects of rhizosphere soils of *C. odorata* plants.



Mixed-species flocks important for biodiversity conservation in tropics

Aimed to explore the conservation implications of mixed-species bird groups, Dr. Christos MAMMIDES of XTBG and his colleagues from Sri Lanka and India conducted a study in the Sri Lankan and Western Ghats biological diversity hotspot. Their study found that the flock system may influence species' sensitivities to land use in one of three ways. First, flocking species were particularly



Two nuclear species in Sri Lanka, the orange-billed babbler (OBBA, *Turdoides rufescens*; orange bars) and the Sri Lanka white-eye (SLWE, *Zosterops ceylonensis*; white bars).

sensitive to disturbance, being more exclusive to forest, and flocks outside of forests are particularly important to the forest-preferring birds that remain in these areas.

Furthermore, different attendant species preferred different leading species and the leading species may themselves vary in their habitat preferences. Finally, forest-interior species, when found outside of forests, had higher propensities to flock relative to other species than when inside forests. The researchers concluded that mixed-species flocks can serve as targets of conservation policies in tropical countryside landscapes.

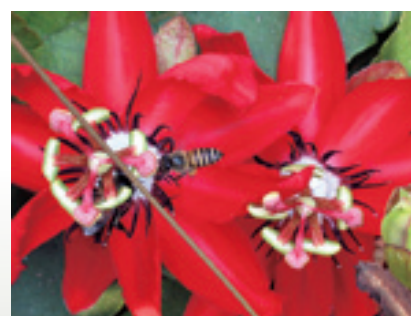
The study entitled “Does mixed-species flocking influence how birds respond to a gradient of land-use intensity?” has been published in *Proceedings of the Royal Society B: Biological Sciences*.

New progress has been made on *Apis cerana* studies

Prof. TAN Ken of XTBG and his colleagues have devoted their research on honey bees (*Apis cerana*) for long time. New progress has been made in 2015. They used six *Apis cerana* colonies to study the effects of imidacloprid, a neonicotinoid pesticide, on *A. cerana*. The study showed that learning impairment can affect adults and bees exposed as larvae. The adult bees reduced olfactory learning acquisition after ingesting a single imidacloprid dose as low as 0.1 ng/bee. The olfactory learning of bees exposed as larvae to imidacloprid (0.24 ng/bee) has been harmed, although the dose did not reduce survival to adulthood. The results support research suggesting that *A. cerana* may be more

sensitive to pesticides than *A. mellifera*. The study entitled “A neonicotinoid impairs olfactory learning in Asian honey bees (*Apis cerana*) exposed as larvae or as adults” has been published in *Scientific Reports*.

Moreover, TAN and his colleagues have investigated the effect of phantom alternatives on feeder preferences in *Apis cerana*. Their research results suggested that, as in humans, the phantom decoy effect occurred when bees were confronted with an attractive phantom alternative. Their findings highlighted the importance of considering the potential for phantom effects when studying the foraging behavior of animals. The study entitled “Phantom alternatives influence food preferences in the eastern honey bee *Apis cerana*” has been published in *Journal of Animal Ecology*.

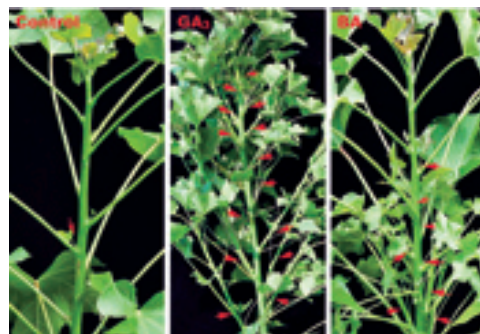


A honey bee foraging passion flower.

Gibberellin Promotes Shoot Branching in *Jatropha curcas*

Prof. XU Zeng-Fu and his group at XTBG have made new progress in *Jatropha curcas* studies. Their research showed that gibberellin acts as a positive regulator in the control of shoot branching in the woody plant *J. curcas*.

They found that gibberellin and cytokinin (CK) synergistically promote lateral bud outgrowth, and that both hormones influence the expression of putative branching regulators, *J. curcas* BRANCHED1 and BRANCHED2, which are key transcription factors maintaining bud dormancy. Moreover, treatment with paclobutrazol, an inhibitor of *de novo* gibberellin biosynthesis, significantly reduced the promotion of bud outgrowth by CK, suggesting that gibberellin is required for CK-mediated axillary bud outgrowth. In addition, Strigolactone (SL), a plant hormone involved in the repression of shoot branching, acted antagonistically to both gibberellins and CK in the control of lateral bud outgrowth. Their research showed that gibberellin also induces shoot branching in many other trees, indicating that



Gibberellin promotes shoot branching in *J. curcas*.

a more complicated regulatory network occurs in the control of shoot branching in some perennial woody plants. The study entitled “Gibberellin promotes shoot branching in the perennial woody plant *Jatropha curcas*” has been published in *Plant & Cell Physiology*.

Tree hollows influence estimates of stem biomass in old-growth forests

Dr. ZHENG Zheng and his colleagues of XTBG conducted a study in a well preserved old-growth evergreen broad-leaved forest that consists primarily of species of *Fagaceae*, *Theaceae*, *Lauraceae* and *Magnoliaceae* in the Ailao Mountains. The researchers measured respiration rates of wood inside tree hollows, logs (downed tree trunks) and snags (standing dead trees) using infrared CO₂ analysis. The study found that the decomposition of wood inside living tree hollows was slow, only half that of downed tree trunks, due to their lower moisture content. Although wood decomposition in tree hollows was slow, it still caused the formation of large hollows or pipes in trunks. Hollow development could cause a considerable overestimate of biomass in old-growth forest. The researchers suggested that tree hollow development should be taken into account in future calculations of forest carbon stocks.

The study entitled “Hollows in living trees develop slowly but considerably influence the estimate of forest biomass” has been published in *Functional Ecology*.



Studies on soil ecology in Xishuangbanna rainforest

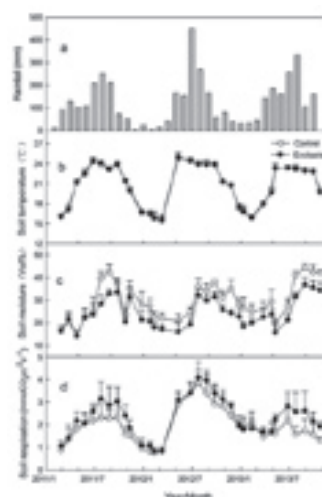
In 2015, researchers of XTBG have conducted a few studies on soil ecology in Xishuangbanna rainforest, and have achieved much progress.

Prof. ZHANG Yi-Ping and his team aimed to determine the long-term effects of drought on soil respiration and the dependence of soil respiration on environmental parameters. Over three years of the study period, soil temperature showed no difference between two treatments, while soil water content decreased significantly in the precipitation reduction treatment, especially during the rainy season. The results showed that the influence of drought on soil respiration depended on a variety of factors and was seasonally dependent, with soil respiration being less sensitive to drought in the dry season. Compared with the annual soil respiration accumulation, the increment of annual soil carbon emissions in the reduction treatment was considerable and should not be ignored. The study entitled “Effects of continuous drought stress on soil respiration in a tropical rainforest in southwest China” has been published in *Plant and Soil*.

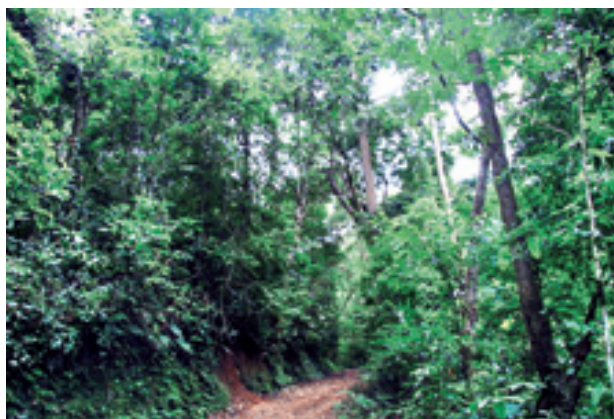
Prof. ZHANG Yi-Ping and his team also found that the soil DOC and DN concentrations under the litter bags decreased significantly after an initial peak with increasing degradation and decomposition of litter. The researchers concluded that DN dynamics was associated with variations in monosaccharide components. The study made it clear that litter decomposition was the predominant factor controlling surface-soil DOC and DN dynamics. The study entitled “Direct effects of litter decomposition on soil dissolved organic carbon and nitrogen in a tropical rainforest” has been published in *Soil Biology and Biochemistry*.

Under the supervision of Prof. CHEN Jin, Dr. XIA Shang-Wen and his colleagues of XTBG conducted a study within a 20-ha forest dynamics plot, in a tropical seasonal rainforest in Xishuangbanna. They found that soil properties had

large and distinct spatial variability within the 1-ha plot. The results suggested that two different processes influenced soil heterogeneity. The low level of topographic variation within that small area was strongly associated with soil pH but poorly associated with all soil nutrients. Soil nutrients were significantly correlated to litter fall chemical fluxes. The study entitled “Scale-dependent soil macronutrient heterogeneity reveals effects of litter fall in a tropical rainforest” has been published in *Plant and Soil*.



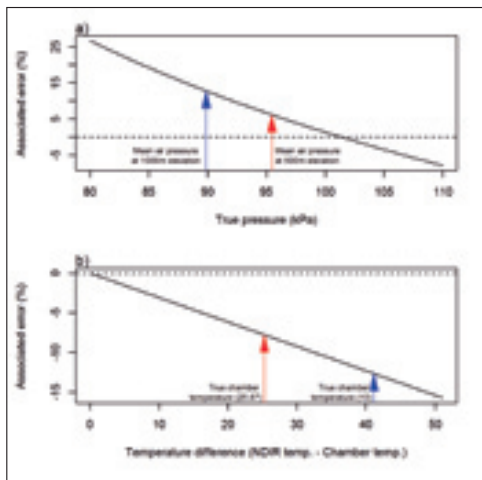
Experimental results.



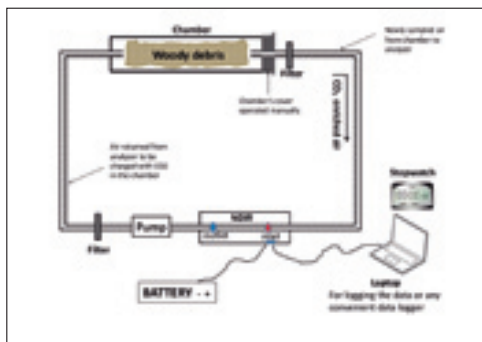
Tropical forest of Xishuangbanna.



Avoid mistakes in calculating respiration rates of dead wood



Estimated errors in the CO_2 efflux calculation due to errors encountered in the literature.



Schematic diagram of a closed-chamber system for measuring WD respiration with a non-dispersive infrared sensor (NDIR).

Carbon cycle consists of assimilation of C through photosynthesis and C release through respiration. There is a crucial need for a common and standardized framework for studies using closed chambers linked to a NDIR.

Together with his teachers, Gbadamassi G.O. DOSSA of XTBG consulted a large amount of literature and reviewed the methods of calculating respiration rate. They aimed to present the theory behind the CO_2 flux calculation when using a NDIR linked to a closed chamber and further illustrate the shortcomings in previous studies and their effects on CO_2 efflux calculations. The application of incorrect formulae in the calculation of CO_2 shed doubt on some previous results. The researchers provided details of appropriate formulae and briefly covered other relevant topics. By using appropriate formula, the reliability of data on the decomposition of woody debris will be improved and it will enhance understanding of how the process will affect and be affected by climate change.

The study entitled "Correct calculation of CO_2 efflux using a closed-chamber linked to a non-dispersive infrared gas analyzer" has been published in *Methods in Ecology and Evolution*.



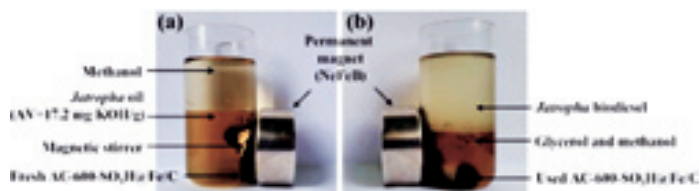
Respiration system.



A novel route with five steps to produce a new magnetic carbonaceous acid

Sulfonated activated carbon acid (AC-SO₃H) can catalyze both esterification and transesterification to produce biodiesel from oils with high acid value (AV) without pretreatment.

Prof. FANG Zhen and his team of XTBG conducted a study aiming to synthesize magnetic carbonaceous acids with high acidity and strong magnetism for biodiesel production from oils with high acid value. A novel route with five steps by double hydrothermal precipitation and pyrolysis, as well as sulfonation was used for the catalyst synthesis:
(i and ii) magnetic core → (iii) magnetic carbon → (iv) carbonized magnetic



Biodiesel production and catalyst separation in reaction quartz cup: (a) before and (b) after reaction.

carbon → (v) magnetic carbonaceous acid (catalyst).

It was found that pyrolysis temperature at 600 °C led to excellent structure to produce catalyst with high acid density (2.79 mmol/g) and strong magnetism (14.4 Am²/kg). It was also found that ultrasound can resist free fatty acids. High biodiesel yield (90.7%) was still achieved from high AV oil (4.8) at low US energy density (0.1 W/mL) with Na₂SiO₃ catalyst.

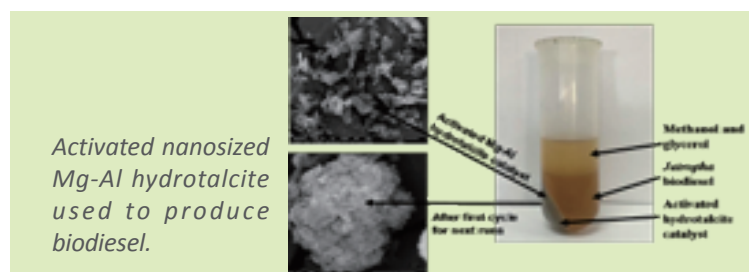
The study entitled “Biodiesel production direct from high acid value oil with a novel magnetic carbonaceous acid” has been published in *Applied Energy*.

Activated Mg-Al hydrotalcite-calcium nanoparticles synthesized to produce biodiesel from oils with high acid value

Prof. FANG Zhen and his team of XTBG conducted a study aiming to directly produce biodiesel from oils with high acid value without any pretreatment using activated nanosized Mg-Al hydrotalcite. The catalyst presented both acidic and basic to catalyze esterification and transesterification due to the formation of Mg₄Al₂(OH)₁₄•3H₂O, Mg₂Al(OH)₇, and AlO(OH) nanoparticles. Under conditions of 5 wt% HT-Ca, 160 °C, 30/1 methanol/oil molar ratio and 4 h, 93.4% *Jatropha* biodiesel yield was obtained at AV of 6.3 mg KOH/g with 4 cycles (biodiesel

yield > 86%). It was further found that it can resist free fatty acids to achieve 93.4% *Jatropha* biodiesel yield at AV of 6.3 mg KOH/g and recycle 4 times with biodiesel yield >86%. Soybean biodiesel yield reached 92.9% even from oil with high AV of 12.1 mg KOH/g. Thus, HT-Ca catalyst showed a potential practical application for direct production of biodiesel from oils with high AV without pretreatment.

The study entitled “One-step production of biodiesel from oils with high acid value by activated Mg–Al hydrotalcite nanoparticles” has been published in *Bioresource Technology*.



Human disturbance overrides island biogeographical processes of insects and plants

Human disturbance now occurs at both global and local scales, which can no longer be ignored when considering island biogeography and other ecological processes. Dr. Aki NAKAMURA and Masatoshi KATABUCHI of XTBG and their colleagues at the Queensland Museum, Australia, conducted a study to investigate the role of human disturbance in island biogeography of arthropods (insects and spiders) plants across islands. They found that infestation of introduced ant species, *Pheidole megacephala*, was one of

the most important factors, which was negatively associated with the species richness of other ants, beetles and flies. The presence of frequent human visitation and resort facilities was associated with increased exotic cockroach and plant species richness. The impacts of human disturbance, however, were highly variable across different groups of arthropods and plants. Their study demonstrated that human disturbance and proliferation of invasive species can override other biogeography processes such as habitat size and the diversity of resources. The relative importance of these factors, however, varied depending of the taxonomic groups studied.

The study entitled “The role of human disturbance in island biogeography of arthropods and plants: an information theoretic approach” has been published in *Journal of Biogeography*.

Epiphytic bryophytes important to conserve biodiversity on a geographical scale in Yunnan

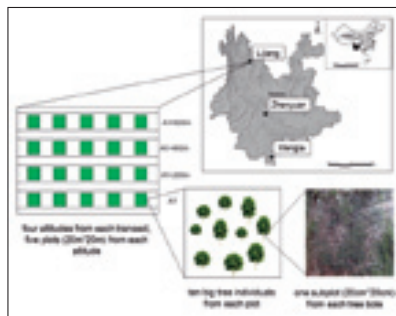
Prof. LIU Wen-Yao and his team of XTBG investigated bryophytes on tree boles in three protected forested areas in sub-montane, montane and sub-alpine regions in Yunnan. In the study, 226 epiphytic bryophyte species belonging to 101 genera and 46 families were recorded. This study was the first assessment of species composition and diversity patterns of epiphytic bryophytes on a geographical scale in SW China, and provides

fundamental data allowing an evaluation of biodiversity in Yunnan Province. The researchers determined that almost all of the epiphytic bryophyte species (99%) were considered locally rare. The researchers concluded that conserving these forests and the bryoflora is very important. Furthermore, the regional pattern of lower epiphytic bryophyte diversity in warmer, drier areas shown in this study reveals how emerging climate change threatens Yunnan's epiphytic bryophytes.

The study entitled “Bole bryophyte diversity and distribution patterns along three altitudinal gradients in Yunnan, China” has been published in *Journal of Vegetation Science*.



Rich bryophytes on tree boles.



plots.



XTBG scientists won Yunnan Provincial Natural Science Award 2014



The award ceremony for the Yunnan Science & Technology Prize 2014 was held on September 25 in Kunming. Among the prize winners, Dr. ZHANG Jiao-Lin and his team of XTBG were honored with the second prize of the Yunnan Provincial Natural Science Award. They were awarded for accomplishing the project entitled “Hydraulic Traits and Physiological Functions of Woody Plants at the North Limit of Asian Tropics under Monsoon Climate”.

New books

Dai Plant Vernacular Names & Explanations in Xishuangbanna, Yunnan by Prof. XU Zai-Fu, YAN Han-Dan, DUAN Qi-Wu and ZHOU Hui-Fang was published by China Science Press in 2015. The book provides the 1,395 Dai names of 1,175 plant species, information which the authors obtained was from more than 50 years’ of surveys and collections. Readers could acquire knowledge regards Dai ethnology, plant resources study, ethnobotany, biodiversity conservation and other scientific studies from the book.

Following the first two volumes, Prof. FANG Zhen edited volumes 3, 4 and 5 of his series book *Biofuels and Biorefineries*, and published by the Springer Press. The themes of the three volumes are: Production of Hydrogen from Renewable Resources, Production of Biofuels and Chemicals with Microwave and Production of Biofuels and Chemicals with Ultrasound. These books provide state-of-the-art reviews,



current research and prospects of producing hydrogen using bio, thermal and electrochemical methods and covers hydrogen separation, storage and applications, and current research advances and prospects in theoretical and practical aspects of microwave irradiation including properties.

The book entitled *Exotic Flowers and Rare Trees in Tropical Rainforest* by HU Jian-Xiang, HUANG Jian-Ping and WANG Ping-Yuan has been published by the China Forestry Publishing House. More than 100 kinds of exotics flowers and rare trees are shown with beautiful pictures.

Improvement of Research Facility

Project “Determination of fatty acids by gas chromatography, an accessory equipment of isotope mass spectrometer” passed the acceptance by CAS

XTBG project “Determination of fatty acids by gas chromatography, an accessory equipment of isotope mass spectrometer” successfully passed the acceptance by CAS. This project expands the application of isotope mass spectrometer in the quantitative determination of fatty acid. It also improves the utilization rate of the equipment IsoPrime100 and meets the urgent demand for the researchers to test the fatty acids in XTBG.

This work was supported by “The equipment functional development of technological innovation projects of CAS”, with a total of 300,000 Yuan was funded.



The improved gas chromatography, an accessory equipment of the isotope mass spectrometer.

Development of the Institutional Repository (IR) of XTBG



Institutional Repository (IR) of XTBG.

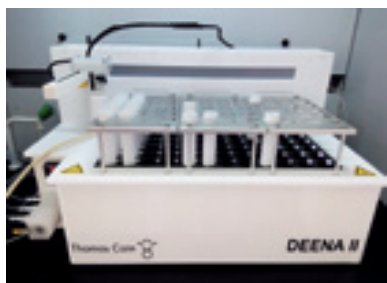
XTBG has implemented the construction of the Institutional Repository (IR) since 2011. The main purpose of XTBG-IR is to manage, preserve, and maintain the digital assets, intellectual outputs, and history of the institute.

XTBG-IR contains a wide range of materials that reflects the intellectual wealth of XTBG, such as, journal articles, conference papers, doctoral theses and dissertations in full text. Depositing academic work in the open access repository increased the profiles of XTBG researchers on a world-wide scale, increasing both the dissemination and the impact of the research they undertake. With IR as a platform, the scholarly and creative work of XTBG staff and students are preserved, indexed and showcased for global audience. Up to now, XTBG-IR has gotten more than one million visits, and more than 160,000 papers have been read or downloaded.



Further improving the Ecological Process and Applied Ecology Platform

For further improving the Ecological Process and Applied Ecology Platform of XTBG, three instruments including Soil Pretreatment System, Laser Particle Size Analyzer and Elemental Analyzer have been installed in 2015. The installation of these instruments was



Soil Pretreatment System.



Elemental Analyzers (the white one is new).

supported by the special fund on repairing and purchasing of CAS.

Through several years of construction, the platform has about 30 instruments. It is open to all XTBG researchers, and provides technical advices such as sample collection, analytical methods, experimental operation. Eleven SCI papers published by XTBG scientists in 2015 in well-known international journals, such as *New Phytologist*, *Journal of Ecology*, *Scientific Reports*, *Bioresource Technology*, cited data from the platform.

Biogeochemistry Laboratory passes the reassessment of the Laboratory Accreditation

From November 27 to 29, the Biogeochemistry Laboratory of XTBG was reassessed by the Yunnan Provincial Bureau of Quality and Technical Supervision. The evaluation group comprehensively examined the establishment and operation of the laboratory management system, its equipment and facilities, quality control, and other aspects. The laboratory gained the recognition from evaluation group in the following aspects: effective quality management system, excellent organization and management framework, advanced hardware, high-quality staff, and reliability of the test report. The Biogeochemistry Laboratory passed the reassessment and gained the inspection and testing ability cognizance for 48 indices of the soil, plant and water.



The Metrology Accreditation Certificate -2015.

The completion of 3H project

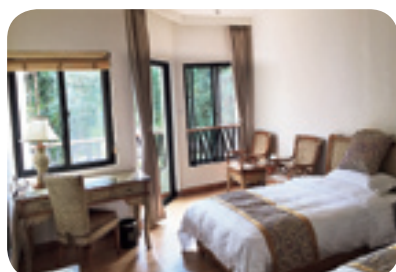
About 90 XTBG staff members moved into the new apartments of 3H (Housing, Home, Health) in July 2015. The apartments were designed integrating local geological and Dai ethnical characteristics. Five main buildings, a 210-m suspension bridge, parking lots and athletic facilities, covering more than 10,000 m² of land, are included in the project, which is considered an important mission of CAS “Great Logistics” academic support system. It is also one of the biggest actions of guaranteeing the accomplishment of the “Innovation 2020” and “1-3-5”



Housings of the 3H project.

plans. The completion of the 3H project solves the housing shortage problem of XTBG.

The Royal Waterlily Hotel Xishuangbanna put into use



The renovation work of the Royal Waterlily Hotel Xishuangbanna was completed in November. It was an expansion project of the previous XTBG Scientists Activity Center. The hotel was designed by a Thai team. After the work of previous- building renovation, expansion and redecoration, XTBG rebuilt the surrounded landscape, made the hotel a comprehensive hotel with accommodation, dining and conference service. The using of the Royal Waterlily Hotel provides visitors a better experience in XTBG.



Conferences and Symposia

2015 Annual Conference of Chinese Botanic Gardens

The 2015 Annual Conference of Chinese Botanic Gardens was held in XTBG on November 12-13. Themed “Development of ecological civilization -- mission of botanical gardens”, the meeting attracted 410 representatives from 62 botanical gardens, 26 research institutes and 24 international organizations.

The conference included four symposia: a) biodiversity conservation and sustainable utilization of plant resources, b) environmental education and ecotourism, c) gardening management and breeding of horticultural cultivars, d) development and prospect of botanic gardens. 6 keynote speeches, 86 presentations, and 20 posters highlighted the achievement in scientific research, public education, gardening and horticultural display of botanical gardens over the past years.

Prof. HE Shan-An, former president of the International Association of Botanic Gardens (IABG), Prof. HUANG Hong-Wen, general secretary of East Asian Botanical Garden Network (EABGN), Prof. Vernon H. HEYWOOD, president of the International Association of Botanic Gardens (IABG), Prof. Stephen BLACKMORE, chairman of Botanical Garden Conservation International (BGCI), and other outstanding scholars presented at the meeting.

The conference witnessed honor awarding to lifetime



Prof. HE Shan-An delivers a plenary presentation.



LI Hong-Wei chairs the opening ceremony.



Group photo.

achievement of Chinese botanical gardens and prize conferring to young researchers for best oral presentations. Taking advantage of international veteran botanists in Xishuangbanna, CUBG held a consultation meeting on CUBG development, and Sanmen Subtropical Botanical Garden of Zhejiang province sought advice during the sidelines. A workshop of China Biodiversity Conservation and Green Development Foundation was also held. The annual meeting 2016 is to be held in Beijing.

International Workshop on Forest Canopies: Frontiers of Ecosystem Services

The International Workshop on Forest Canopies, chaired by Professor CAO Min of XTBG and Roger KITCHING, visiting professor of XTBG, was held in XTBG from October 27 to 29. Over 50 participants with various backgrounds made a visit to XTBG from 10 countries and regions. The workshop provided opportunities for many participants to showcase their research and to propose future projects associated with canopy studies. Participants were split into themed groups to discuss about potential collaborative projects that bring together international canopy scientists and



International Workshop on Forest Canopies.

use networks of canopy cranes to address important research questions.

The workshop was concluded with great success and the 7th International Canopy Conference will be held in London in August of 2016. The networking amongst canopy scientists and canopy crane operators are critical to progress canopy sciences and this workshop has significantly promoted international collaboration.

The Third Sino-German Meeting

The Third Sino-German Meeting: the Yunnan biodiversity hotspot- its history and future threats, was held in Kunming on August 4-10. The meeting was jointly hosted by Prof. ZHOU Zhe-Kun from XTBG and Prof. Volker MOSBRUGGER from the Senckenberg Research Institute and Museum. More than 60 scientists from China, Germany, UK, Japan and the Netherlands attended the meeting, which was funded by the Sino-German Center of the Natural Science Foundation of China (NSFC). 39 oral presentations were made during this meeting. The meeting was composed of four symposia: 1. When did the Yunnan hotspot first appear in earth history, and how did diversity evolve? 2. Main drivers in the evolution of biodiversity. 3. Threats of ecosystems and their diversity. 4. Summary and discussion on achievements of recent research and project planning in breakout groups. Conclusively it was decided to set about a joint major research project focusing on biodiversity of Yunnan, as one of the actual, global biodiversity hotspots.

The first Sino-German Meeting was held in Jinghong in 2007, with the theme “Rural development by land use diversification: stakeholder based strategies and integrative technologies for agricultural landscapes in mountainous Southwest China”. And the second one was held in XTBG in 2013, themed as “Late Cenozoic Environmental Change in Eastern Eurasia and Its Impact on Past and Present Biodiversity”. The next meeting is to be held in Germany in 2016.



HU Hua-Bin delivers a welcome speech.



Discussion.



Group photo of participants.



Workshop on Conservation on the Borders

The workshop "Conservation on the borders: an evaluation of the role and future of transboundary protected areas in Southern China" was held in XTBG on March 1-4, with 41 participants

Xishuangbanna Declaration on protecting biodiversity and eliminating illegal wildlife trade along the China-Myanmar-Laos-Vietnam transboundary region
关于中、缅、老、越跨境地区生物多样性保护和减少非法野生动物贸易的西双版纳宣言
The participants in the workshop "Conservation on the Borders" (Appendix)
“跨境保护研讨会”与会代表(附录)

RECOMMEND strengthening the enforcement of existing legislation, identifying gaps in current regulations, identifying opportunities for new transboundary protected areas and improving the management of existing ones, and creating a cohesive transboundary management strategy for monitoring and effectively protecting high priority areas for biodiversity in border regions

建议 加强现有法律法规的执行,发现现行法律法规的不足,寻求机会建立新跨境保护区,加强现有保护区的管理,并制定协同的策略,以便加强生物多样性优先区域的有效监测和保护。

RECOGNIZING the importance of networking between multiple institutions to encourage information sharing, sustained engagement and collaboration across transboundary regions

认识到建立跨机构合作网络的重要性,以增进跨境地区的信息共享、持续参与和合作。

RECOGNIZING the need to develop standardized monitoring protocols and a platform for gathering and disseminating relevant information

认识到开发标准化的监测方案、建立相关信息收集发布平台的需求。

RECOGNIZING the importance of education and community involvement in the development of successful conservation strategies to eliminate the illegal wildlife trade and unsustainable resource use

认识到在制定成功的保护策略过程中教育和社区参与的重要性,以减少非法野生动物贸易和资源的不可持续利用。

STRONGLY RECOMMEND the Government of China, in collaboration with the Governments of Myanmar, Laos and Vietnam, to lead in championing the role of effective transboundary protected areas and tackling illegal wildlife trade, thus ensuring a future for regional biodiversity.

强烈建议中国政府同缅甸、老、越政府合作,在支持跨境保护区建设和打击非法野生动物贸易方面发挥主导作用,确保地区生物多样性的美好未来。

Xishuangbanna Declaration.

from 24 research institutes and NGOs from XTBG, UK, Singapore, Netherlands, USA, and Myanmar.

It was aimed at strengthening biodiversity conservation and eliminating illegal wildlife trade

along the China-Myanmar-Laos-Vietnam transboundary regions.

The workshop was highlighted by a speech given by Prince William, the Duke of Cambridge, about the illegal wildlife trade.

The participants recommend strengthening the enforcement of existing legislation, identifying gaps in current regulations, identifying opportunities for new transboundary protected areas and improving the management of existing ones, and creating a cohesive transboundary management strategy for monitoring and effectively protecting high priority areas for biodiversity in border regions. They also recognize the importance of networking between multiple institutions to encourage information sharing, sustained engagement and collaboration across transboundary regions.

“Xishuangbanna Declaration on protecting biodiversity and eliminating illegal wildlife trade along the China-Myanmar-Laos-Vietnam transboundary region” was proposed during the workshop.



Group photo.

Workshop of Young Scientists on Biodiversity and Conservation Biology in Southwest China

During July 10-13, the second workshop of “Young Scientists on Biodiversity and Conservation Biology in Southwest China” was held in Kunming, with CAS Kunming division and Kunming College of Life Science, UCAS as sponsors, XTBG undertook and organized the workshop. More than 80 young researchers and students joined the meeting. The theme of the workshop was “Conservation Genetics Research”, the application of genetic biotech in conservation biology was discussed. Three professors from Tohoku University were invited to contribute to the workshop. Dr. Alison K.S. WEE of XTBG hosted the

workshop. The workshop was divided into two parts: research presentations on conservation were presented in the first two days, during which eleven young scientists presented their research work, and during 11th to 13th, training course on MIG-Seq technique based on NGS was launched.

Workshop on Biodiversity in Southeast Asia

During January 26 to 31, the Workshop on Biodiversity in Southeast Asia was held by XTBG in Kunming, which attracted more than fifty participants from sixteen institutes in Southeast Asia. Twenty- one presentations showcased research on biodiversity and conservation work in Southeast Asia were made during the workshop. The participants recognized the inherent, social, cultural and economic values of biodiversity to Southeast Asia, in addition to the growing threat of human activities and climate change to Southeast Asian biodiversity and the moral obligation of scientists from this region at the interface between scientific research and biodiversity conservation.

“Recommendations on Biodiversity Research and Conservation in Southeast Asia” was discussed and released on the workshop. The Recommendations suggest launching multidisciplinary and



long- period research, data sharing, building biodiversity conservation network and other ways to promote biodiversity research and conservation in Southeast Asia.

The 3rd Workshop on Science and Technology Cooperation

The 3rd Workshop on Science and Technology Cooperation, under the cooperation between CAS on one side and the Thai Ministry of Science and Technology (MoST) and the Thailand Research Fund (TRF) on the other side, was held in Bangkok on August 20. The workshop was aimed to strengthen cooperation between CAS and Thai institutions.

The workshop was presided over by Pichet DURONGKAVEROJ of Thai MoST. CAS vice president ZHANG Ya-Ping was in presence and made an opening speech. More than 50 scientists from Thailand and CAS institutes participated in the workshop. The scientists discussed such research topics as the bioactive compounds in organisms, the



Prof. CHEN Jin makes a plenary presentation.

commercially developed natural extracts, the test of medicinal performance, research and development of the agricultural technology in marine and oceanography in mushroom growing, and in microbiology.

Prof. CHEN Jin, director of XTBG, made a plenary presentation entitled “Biodiversity Conservation in Rapidly Changing Tropical Asia: Multiple-Disciplines, Integrative Approaches and Partnerships”, which raised concerns and interest among the participants.

It was decided that the 4th CAS-Thai Workshop on Science and Technology Cooperation will be held in XTBG in 2016.





Richard CORLETT delivers a plenary lecture.



XTBG participants at ATBC 2015.

The 52nd Annual Meeting of ATBC

The 52nd Annual Meeting of the Association for Tropical Biology and Conservation (ATBC) was held in Honolulu, Hawaii on July 12 -16, with about 400 tropical conservation biologists around the world present. The theme was “Resilience of Island Systems in the Context of Climate Change: Challenges for Biological and Cultural Diversity and Conservation”. Eight scientists of XTBG participated in the meeting and made presentations, and Alice HUGHES and Kyle TOMLINSON both led workshops on Spatial Ecology and Statistics. Prof. Richard CORLETT was invited as a keynote speaker to deliver the plenary session. His presentation was entitled “Conservation in an Era of Rapid Global Change”.

2015 Annual Meeting of the ATBC Asia-Pacific Chapter

From 30 March to 2 April, twenty-four people from XTBG attended the ATBC meeting in Cambodia, with Richard CORLETT giving a plenary presentation entitled "Welcome to the Anthropocene!", and XTBG researchers organizing and chairing eight of the symposia at the conference. Kyle TOMLINSON gave a workshop on "R and Basic statistics" and Alice HUGHES, in addition to being one of the main organizers of the conference led a workshop in GIS and species distribution modeling and a second workshop for early career researchers. In total XTBG based researchers gave twenty-three presentations at the conference, and additionally seventeen former AFEC-X and other XTBG course attendants reunited at the conference, many of whom won prizes. Carla MONOY won a prize for one of the best oral presentations, and two students from the XTBG course on the ecology of climate change in the tropics and sub-tropics (Tuanjit SRITONGCHUAY, and Krizler TANALGO) won first and second prizes for their oral presentations. Additionally, Alice HUGHES was elected to become secretary of the Asia Pacific Chapter of the ATBC for the next two years.



XTBG participants at the meeting.

The First World Forum on Ecosystem Governance

Dr. Alice HUGHES of XTBG was invited to attend the First World Forum on Ecosystem Governance and Future Leaders Academy by the State Forestry Authority of China. The Forum was held on 25 October in the Great Hall of the People in Beijing. It was co-hosted by State Forestry Administration (SFA), International Union for the Conservation of Nature (IUCN), the IUCN Commission on Ecosystem Management (CEM), the Beijing Municipal Government, and the Asia-Pacific Network for Sustainable Forest Management and Rehabilitation. The Future Leaders Academy started on the evening of the 23rd of October, and continued until midday on the 25th. Twenty-one prominent researchers



from eleven countries were invited to attend the Academy, which focused on identifying challenges to the successful management and governance of ecosystems, and how we might better approach such challenges.

A Beijing Declaration on Ecosystem Governance and a Future Leaders Declaration (led by Alice HUGHES) were released on the forum.

During the closing ceremony, Dr. HUGHES gave a closing speech, highlighting the challenges to successful and sustainable ecosystem governance and suggesting new approaches to these challenges.

The 7th International Symposium on the Family Zingiberaceae

The 7th International Symposium on the Family Zingiberaceae took place in Chiang Mai, Thailand on August 17-20. The Botanical Garden Organization of Thailand hosted the symposium under the theme “Gingers for Life”. HRH Maha Chakri SINRINDHORN was in presence and delivered a speech on ginger and culture of Thailand. Prof. LI Qing-Jun of XTBG was invited to present a lecture entitled “The re-finding of long tongued fly pollination of *Roscoea* on Himalayas” at the plenary session. He also chaired two of the five sessions. With 180 representatives throughout the world, the symposium highlighted recent developments and research related to the family Zingiberaceae. The International Symposium on the



Family Zingiberaceae is held every three years. XTBG was the host of the 5th International Symposium on the Family Zingiberaceae in 2009.





XTBG presents at 2015 BGCI International Congress on Education in Botanic Gardens

More than 300 botanic garden educators from 43 countries convened at the Missouri Botanical Garden, St. Louis, Missouri from April 26 to May 1 for the 9th International Congress on Education in Botanic Gardens, jointly hosted by the Missouri Botanical Garden and BGCI. The theme of the congress was “Biodiversity for a Better World: Wild Ideas Worth Sharing”. Four environmental educators from XTBG presented their work at the congress.

This Congress is organized by BGCI every three years in different locations throughout the globe, provides an international forum for botanic garden educators worldwide to share experiences, set priorities and targets and review current trends and developments in environmental education.

XTBG Seminar Program

Since its establishment in 2010, the XTBG Seminar Program has conducted more than 230 seminars, with new speakers virtually every week in 2015. A total of 46 talks were given by speakers from the USA, the UK, Australia, India and 17 other countries. Mr. Rhett BUTLER, the founder and editor of Mongabay.com, Dr. Renee BORGES of Center for Ecological Sciences Indian, Dr. James NIEH of University of California, San Diego, USA and other prominent scientists on ecology, biodiversity conservation, resource plant studies and other research fields were invited

to talk in XTBG.

XTBG Seminars are held on every Tuesday, with video link to the XTBG Kunming division. Talk language is in English. The program provides XTBG scientists and students a platform to communicate with international researchers while helping outsiders know more about the institute.





Horticulture

Photo by LIU Guang-Yu

Facts:

1. Total number of accession: 20,425
2. Total number of species: 12,857
3. Total number of unidentified species: 4,997
4. Total number of species from wild: 6,782
5. Number of accession collected in 2015: 1,017
6. Number of species collected in 2015: 1,017

Orchid show and lotus show win applause

“Natural Orchid Show” was held from April 13 to May 4. More orchid quantity and species were displayed than the



last years, more panels were used to introduce ecological characteristics, scientific research, conservation status and cultural connotation of orchids. Blooming flowers attracted many visitors and impressed them much. The orchid show aimed to raise conservation awareness and call more people to participate in protecting wild orchid species.

“Victoria, Lotus and Water lily Show” was held in July. The program feasted visitors with beautiful landscape and cultural meanings. During the month, kids weighing less than 30 kilograms could experience sitting on a huge *Victoria* leaf.

Nudation has been covered in the Ficus Garden

The landscape of the Ficus Garden of XTBG has been much improved in the year of 2015. By paving, mulching and planting ground plants such as *Piper sarmentosum*, *Alocasia macrorrhiza*, and *Rhaphidophora megaphylla*, these local ground plants that provide a natural look, while effectively



Nudation has been covered in Ficus Garden.

covering the nudation. The Ficus Garden is not only an important base supporting scientific research, but also a popular scenic spots.

Seedlings of five orchid species from asymbiotic in vitro seed propagation grow well in the new greenhouse

Seeds of Family Orchidaceae are produced in vast numbers, but the chances that any individuals germinate and grow into an adult plant in the wild are small. Not only do they need to alight in



a suitable habitat, they also need to encounter a suitable fungal partner to complete germination. In vitro techniques for asymbiotic seed germination are useful methods for mass propagation of most orchids. In 2015, using method of asymbiotic seed sowing, 16 orchid species germinated at the tissue culture laboratory of Horticulture Department of XTBG. Over 57,000 seedlings of five epiphytic orchids, *Dendrobium nobile*, *Dendrobium cucullatum*, *Rhynchostylis retusa*, *Vanda coerulea* and *Vanda coreulescens* were taken out and begun their cultivation in the new greenhouse which was put into use at the beginning of 2015.



Red imported fire ant (*Solenopsis invicta*) was prevented scientifically

The red imported fire ant, *Solenopsis invicta*, originating from the Panama River in South America, is one of the most destructive creatures according to the International Union for Conservation of Nature. They are omnivorous, fast breeding, harm large and aggressive,



Bait method has been used to fight fire ants.



Lecture to raise public awareness of fire ant.

and their invasion would threaten the local farming production, ecological environment, and human activities. They were first found in Menglun town in September 2014, the plant protection staffs began to strengthen monitoring and warning in time. In XTBG, fire ants have been first found in October 2015, with effective baiting method and a series of scientific lectures to raise public awareness, the ants were prevented and controlled within a short time.

Endangered fragrant rosewood unlawfully logged in XTBG

A fragrant rosewood tree (*Dalbergia odorifera*) was unlawfully logged, while another was severely damaged in XTBG in the early morning of October 11. The large branch from the logged tree which was 51 years old has a circumference of 113 cm and a cross-sectional diameter of 24 cm and worth millions of Yuan.

Fragrant rosewoods have been widely employed not only as a kind of medicinal material in the pharmaceutical industry, but also famous for luxury furniture and crafts, owing to their sweet fragrance, beautiful surface, high density, and



Cross section of the tree.



The tree with a trunk sawed.

economic value of the heartwood. The species has become endangered as a result of overexploitation.

XTBG has tried its best to help the damaged tree survive. The case was solved in January 2016.

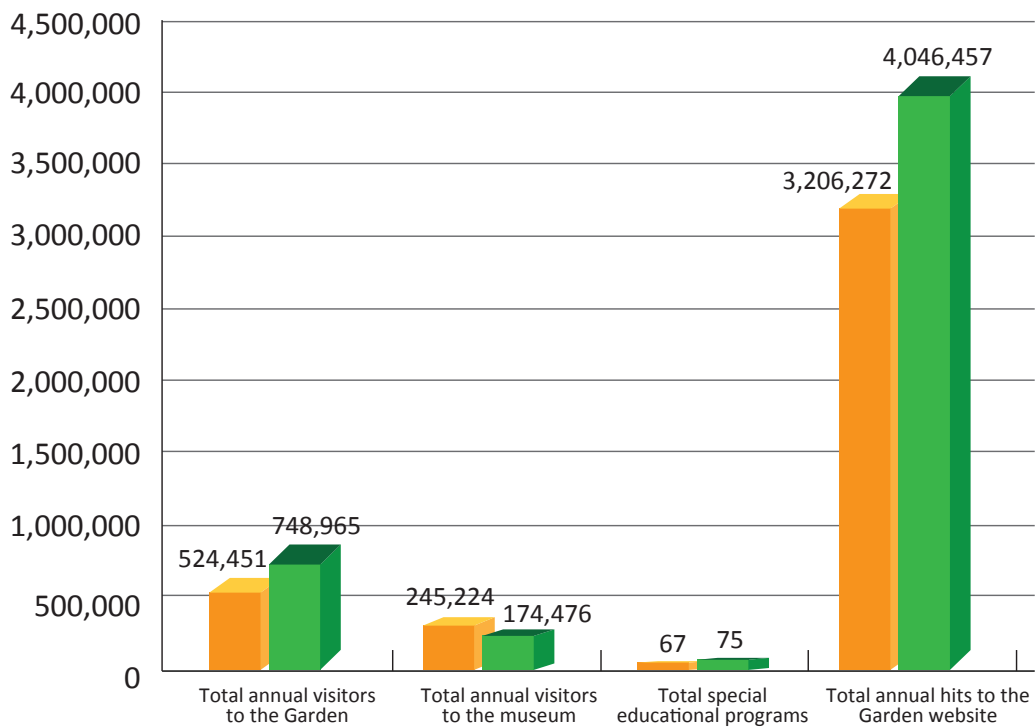
A group of people, mostly young adults, are hiking up a steep, narrow trail in a dense forest. The trail is covered with fallen leaves and ferns. The hikers are wearing backpacks and casual outdoor clothing. The forest is lush with green foliage, including large ferns and tall trees. The scene is captured from a low angle, looking up the trail. A semi-transparent white box with the text "Public Education" is overlaid on the right side of the image.

Public Education

Photo by ZHAO Wen-Ya

Facts:

■ 2014 ■ 2015



Fascination of Plants Day set up a bridge between students and the scientists



Academician XU Zhi-Hong talks about plants and life.



Scientists and students communicate face to face.



Academician XU Zhi-Hong shows students around rare plants exhibition.

The international "Fascination of Plants Day 2015" was launched in XTBG on May 16. Over 200 students from four middle schools in Xishuangbanna Prefecture joined the event. After listening to an impressive lecture on "Plants and Our Daily Life" given by Academician XU Zhi-Hong, the students communicated with the academician. They discussed about

science and how to be a scientist. Following the discussion, the students also enjoyed their time talking freely with the scientists at the Exhibition of Rare and Endangered Plants.

More local kids involved in monthly activities



Science inquiry lecture.



Opening the door of nature.



Plant restoration in the Holy Hill.

More educational activities have been carried out in the local communities, such as Menglun Town, Ailao Mountains, Menglong Town and other remote villages.

Themed activities such as "Opening the door of nature", "The growing *Parashorea*", "Zero Extinction Project: Environmental Educational Activities", have been continued to carry out in the year of 2015. These series of educational program helps XTBG to engage in local communities more effectively. Considering the age difference of the students, XTBG used various methods to carry out environmental education activities. "Nature notes", "Scientific inquiry", "Nature observation" and so on were applied for the local kids, which helped them to recognize more beauty of their surroundings. The lectures themed about biodiversity conservation told lots of stories of what have been done to protect the environment in Xishuangbanna. Most students claimed that they loved their hometown Xishuangbanna more after the activities.



New media of XTBG highlighted

In September 2015, the number of Weibo fans of XTBG reached to 100,000, which was achieved by over 870 pieces of news annually and a series of on-line activities. Live broadcast was also implemented for some important academic conferences and seminars with the purpose of bridging the scientists and the public. A brand-new website of science communication was set on line so that the web surfers could find useful information about what have been done for environmental education. Video making was highlighted this year with the Good Voice of Rainforest being awarded as the Excellent Masterpiece of science communication in Chinese Academy of Sciences.



Winter and Summer Camps

About 1,530 students from all over China took part in winter and summer camps in XTBG, including 19 science camps and 12 nature experience camps. More organizations from big cities, such as Kunming, Shenzhen, became the collaborators. The guidance of some camp activities have been redesigned and rewritten to make them more standardized, the students could choose what they were interested and make each camp meets their needs. Standardized instruction was also used. The organization named of Friends of Nature, spoke highly of the standardized activities.



Colorful activities have been carried out with the camps.



Partnership

Photo by DUAN Qi-Wu

Domestic

The Chinese Union of Botanical Gardens

The Chinese Union of Botanical Gardens (CUBG) was officially launched in June 2013. The secretariat of CUBG is based in XTBG and is responsible for the specific programs set out the council. Over the year of 2015, CUBG took an active and positive role in promoting cooperation among Chinese botanical gardens. Till the end of 2015, 94 botanical gardens of more than 30 provinces throughout China, including Hong Kong, involved in CUBG.

Since the launch of the “Full-cover conservation plan of native plant species in China” in 2014 by CUBG, much progress has been made. Criterion and standard-code of conduct for botanical gardens has been set up after a set of fieldwork and data analyzing.

To have a better development, a consultation meeting was held in XTBG on November 11. The meeting was aimed to gather experience and advice from veteran botanists to guide development. The expert commission was composed of HE Shan-An, XU Zai-Fu, ZHANG Zuo-Shuang, HUANG Hong-Wen, Vernon HEYWOOD, and Stephen BLACKMORE. After listened to a Progress Report on the development of CUBG by Prof. CHEN Jin, CUBG chairman, the experts then put forward advice on future development goals and trends. The experts gave full recognition to the role of CUBG played in promoting development of Chinese botanical gardens, especially the achievements in plant conservation.

Annual work meeting 2015 of the botanical gardens work committee of CAS was held in Guilin, Guangxi on November 1-4. An academic forum was held. Prof. CHEN Jin, together with directors of 12 other CAS botanical gardens, attended the meeting. 22 researchers from 13 botanical gardens presented their research progress at the academic forum.

CUBG “Scientific popularization plan” has launched a series of lectures and other scientific educational activities in more than 30 botanical gardens. More than 300 medias have reported these activities. At the meanwhile, CUBG has worked together with China Central Television (CCTV) taking the documentary “Seeking the Most Beautiful Gardens in China”. XTBG was involved in this



Training Course on Plant Identification and Classification.



Consultation meeting.

documentary.

Training courses were held by CUBG as the past years. “Training Course on Plant Identification and Classification” was held in Shanghai Chenshan Botanical Garden in June; “Environmental Education Training course” was held in XTBG in August; “Training Course on Horticulture and Landscaping” was held in Kunming Botanical Garden and XTBG in October; The first “Botanical Garden Advanced Management Training Course” was held in XTBG. These training courses enhanced botanical gardens’ staff knowledge of conservation and other technical skills.



Fieldwork of "Full-cover



Convolvulus tragacanthoides.

conservation plan".

Pu-er, Yunnan

On January 26, the first joint meeting of Jingdong Subtropical Botanical Garden constructing work was held in Pu-er. The meeting was chaired by Mr. LI Zhao, director of Forestry Bureau of Pu-er City. CHEN Jin and LI Hong-Wei of XTBG joined the meeting. Mr. ZHANG Yu, CPC secretary of Jingdong County reported the progress of environmental evaluation, water protection and land pre-adjudication. A Memorandum of Understanding on the constructing of Jingdong Subtropical Botanical Garden was signed between People's Government of Pu-er and XTBG. Pu-er government held a meeting to mark the initiation of the second stage of construction work on the Jingdong Subtropical Botanical Garden on March 31. Speaking at the meeting, Mr. HU Kun, the deputy Party chief of Pu-er, said that the first stage construction work of the garden has laid a good foundation for subsequent construction work. HU claimed that the construction working group should strengthen their cooperation with XTBG to solve the problems that have arisen during the construction period.



CHEN Jin and deputy mayor YANG Wei-dong signing the MoU.



Group photo of participants in the assessment meeting.



Meeting between XTBG and Pu-er Forestry Bureau.

Plant taxonomists and field botanists gathered together in Pu-er during April 5-9 to assess the endangered status and conservation priorities for plants in Pu-er area. A primary assessment result was reached after the meeting. 6.66% of Pu-er floras are endangered. With the assessment result, XTBG director Prof. CHEN Jin met with local officials of Forestry Bureau and discussed biodiversity conservation in the area. The assessment meeting was part of the work for "Full-cover conservation plan of native plant species in China" launched by CUBG.



Photo by DUAN Qi-Wu

Xishuangbanna, Yunnan

XTBG and Xishuangbanna National Nature Reserve Administration (XNNRA) have had a very strong cooperative relationship. The Tenth Scientific Cooperation Annual meeting was held between the two sides during December 15- 16 in XTBG. Dr. CHEN Jiang-Hua, assistant director of XTBG, and Mr. LIU Lin-Yun, deputy director of the XNNRA, presided over the meeting. More than 50 from XTBG, XNNRA and different local nature reserves joined the meeting. Both sides agreed that the cooperation has been very successful, *e.g.*, the construction of Yiwu Prefectural Nature Reserve, the investigation of orchid species, “Zero extinction” project has been carried out smoothly in Yunnan. The two sides signed a cooperation agreement which indicates in the coming year of 2016, both sides will be working together on monitoring and protecting the Asian elephants, comprehensive scientific



Signing the cooperation agreement.

investigation in Yiwu nature reserve, investigation on national protective animal and plant resources, constructing a think-bank on ecological civilization construction, and other aspects of collaboration.

Hainan

On July 8, Prof. HUANG Dong-Yi, director of College of Agriculture in Hainan University (CAHU) headed a delegation visited XTBG. A combined symposium was held between Key Lab of Tropical Plant Resources and Sustainable Use, XTBG, CAS and Key Lab of Tropical Bio-resources Sustainable Use, Hainan University.



Group photo.



Sign the MoU.

After making a welcome remark, Prof. CHEN Jin, director of XTBG, reviewed both XTBG and Hainan University have done on tropical plants resources conservation and sustainable use. After he briefed Hainan University and College of Agriculture, Prof. HUANG Dong-Yi spoke that XTBG and CAHU are complementary on main research areas and directions. Eleven presentations were made during the symposium.

A MoU was signed between the two sides on combining applying for a State Key Laboratory.

International

Thailand

On invitation, Prof. CHEN Jin and Dr. FAN Ze-Xin visited Thailand Research Fund (TRF), Queen Sirikit Botanic Garden (QSBG), and Chiang Mai University on January 5-9.

During the stay at Thailand, Prof. CHEN Jin made a presentation at the Sino-Thailand Workshop on Biodiversity, as representative of CAS. Suyanee VESSABUTR, director of QSBG warmly welcomed XTBG delegation. CHEN Jin introduced the proposal of establishing CAS- Southeast Asian Biodiversity Research Institute (CAS-SEABRI) and set up a national office in QSBG. Suyanee VESSABUTR indicated that QSBG would support this proposal and further cooperate with XTBG to contribute more to regional biodiversity conservation.

Afterwards, CHEN Jin and FAN Ze-Xin



At Queen Sirikit Botanic Garden.



At Chiang Mai University



XTBG director (L) signs MoU with Kasetsart University.

moved to Chiang Mai University. They talked with Dr. Chitchol PHALARASH and other teachers from Department of Biology. The two sides would further cooperate in biodiversity studies, specimen exchange, joint programs, and student training. During their stay in Thailand, accompanied CAS President BAI Chun-Li, CHEN Jin and FAN Ze-Xin witnessed the signing of a MoU between CAS and TRF.

In August, after joining the Third Workshop on Science and Technology Cooperation, XTBG director CHEN Jin and assistant director FAN Ze-Xin visited National Center for Genetic Engineering and Biotechnology (also known as BIOTEC), Queen Sirikit Botanic Garden, Chiang Mai University, and Kasetsart University. A MoU was signed between XTBG and Kasetsart University. The two sides agreed to cooperate in long-term monitoring of forest dynamics.



CAS delegation visit Chiang Mai University.



CAS delegation visit Queen Sirikit Botanic Garden.

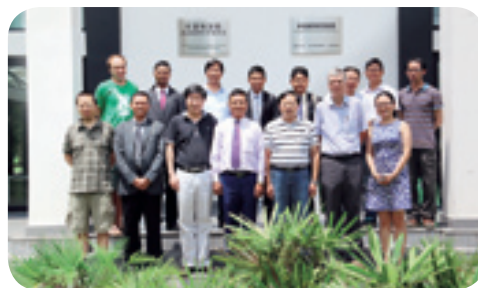


Myanmar

Mr. LI Hong-Wei, CPC secretary of XTBG, headed a 3-people delegation to Myanmar during January 5-10. The visit was for the plan of remodeling and repairing of laboratory building and other facilities of the CAS Biodiversity Research Center in Myanmar. Mr. LI Hong-Wei and Dr. Thaung Naing Oo of Forest Research Institute of Myanmar (FRI) discussed the remodeling plan of laboratory, office, dormitory, canteen, etc. FRI provides a building with an area of 800 square meters for the laboratory of CAS Biodiversity Research Center.

Mr. Kyaw Kyaw Lwin, deputy director of Forest Department of Myanmar Ministry of Forestry, headed up a 5-person delegation to XTBG on June 2-6. The visit was for further promoting the program of CAS Biodiversity Research Center in Myanmar. Prof. CHEN Jin and some other scientists and leaders of XTBG held a meeting with the Myanmar delegation. The two sides had a discussion on cooperation in joint scientific field investigations, development and utilization of medicinal plant resources, training courses, decoration of laboratories based in Myanmar, and graduate students cultivation, etc.

From 24th to 26th August, Academician ZHANG Ya-Ping, vice president of CAS, led 9 delegates from CAS Bureau of International Cooperation and XTBG visited Myanmar Ministry of Environmental Conservation and Forestry (MOECAF) and Chinese Embassy in Myanmar. Mr. Aye Myint Maung, deputy



Group photo of the two sides in XTBG.



Discussion.

minister of MOECAF, showed warm welcome and appreciation to XTBG and CAS. Mr. HONG Liang, Ambassador of Chinese Embassy in Myanmar, indicated that they would provide assistance to XTBG and CAS for more scientific research program cooperation with Myanmar.



Vice minister Aye Myint Maung and Prof. ZHANG Ya-Ping (R).



CAS delegation at Chinese Embassy in Myanmar.



Talent Training and Team Building

Photo by CHEN Ling-Ling

Postgraduate Education

Excellent Doctorial Dissertation Awards

Dr. JIANG Yan-Juan's doctoral dissertation which entitled "Functional Analysis of *WRKY 57* in *Arabidopsis*" was enlisted of CAS Excellent Doctorial Dissertation of 2015. And her supervisor Prof. YU Di-Qiu was honored of "Outstanding Graduate Tutor Award, CAS".

The doctoral thesis entitled "Ecological research of epiphytic lichens in primary



and secondary forests in the subtropical Ailao Mountains" by Dr. LI Su has been enlisted in the 2015 Provincial Excellent Dissertations of Yunnan. Prof. LIU Wen-Yao, supervisor of LI Su, won honor of "Excellent Supervisor of Yunnan Province."

Dr. CHEN Ya-Jun receives CAS President Award

Dr. CHEN Ya-Jun of XTBG was on the list of laureates for 2015 CAS President Award. During his studies in XTBG, CHEN focused on studies of tropical lianas. He has got his research results published in *New Phytologist* and other international journals. The President Award is the top honor for graduate students at CAS.



Graduation Ceremony 2015

The 2015 graduation ceremony and degree awarding was held on June 19. Twelve students were conferred with doctoral degrees and thirty-six students were granted with master degrees.

The graduation ceremony and degree awarding was presided over by XTBG CPC Secretary LI Hong-Wei.

In his address, Prof. CHEN Jin, director of XTBG, sent congratulations to graduates on their successful completion of studies. His talk entitled "Values of education" elucidated the responsibility and accountability of teachers in



Prof. CHEN Jin delivers a speech.



Teachers and students pose a photo after planting a tree for memory.



Tossing hats into the air.

graduate education.

Dr. CHEN Ya-Jun and Ms. XIAO Jian-Hua, graduate representatives, reviewed their life in XTBG, and expressed their heartfelt gratitude to their teachers.

Prof. CHEN Jin moved the tassel of the caps of every graduate to the right place.

A tree of *Ormosia olivacea* L. Chen was planted for memory in front of the students' apartment.

Talent Training

Advanced Fieldcourse in Ecology and Conservation - XTBG 2015

From 12 October to 23 November 2015, XTBG held the Advanced Fieldcourse in Ecology and Conservation - XTBG 2015 (AFEC-X 2015). In total, 101 students and young researchers from 19 countries applied for the course, and finally 32 applicants from 18 institutions in 11 countries were accepted to attend.

The six-week fieldcourse includes four components: lectures and practicals, field trips, independent projects and symposium. During the whole course, 32 XTBG staff members and students were teaching and assisting the course.

The topics of the course including: species distribution modeling workshop, conservation tools, climate change ecology, invasive biology, R statistics and experimental design workshop, plants ecology, insects sampling techniques, bird ecology, bat ecology and various academic skills. All lectures were followed by a practical or demonstration. In addition, the students paid a one-day trip to Xishuangbanna National Nature Reserve to visit the 20-ha dynamic plot, the canopy crane and canopy corridor; and 4-day trip to Yuanjiang Savanna Ecological Station in Yuanjiang National Nature Reserve.

Seven groups, formed according to the students' interests, carried out seven independent projects : 1). Edge effects on herb community in limestone forest and rubber plantation of XTBG: the conservation of native herbs; 2). Does plant diversity increase top-down control of herbivorous insects in tropical forest? 3). Adaptive ability of seedlings of three important tree



Group photo.



Trainees pose a group photo of "AFEC".

species in the limestone forest under two light conditions; 4). Impacts of artificial light on the activity of insectivorous bats in different habitats; 5). Habitat characteristics influence dragonfly diversity and abundance in man-made ponds in XTBG; 6). Influence of functional and social traits of bats on Ectoparasitism in XTBG; and 7). Ecological impacts of rubber plantation on ants.

At the end, a symposium was held to present the findings from the independent research projects.

AFEC-X is mainly supported by XTBG, this year they also got funding from CAS Bureau of Personnel and CAS Graduate Education Foundation.



2015 Excellent Students Summer Camp

From August 4 to 8, the 2015 XTBG Excellent Students Summer Camp was held successfully. 43 outstanding college students gathered together at XTBG. At the opening ceremony, XTBG director CHEN Jin delivered an opening speech and expressed his sincere congratulations and warm welcome to those who came to the camp. XTBG CPC Secretary LI Hong-Wei gave a brief introduction to the garden.

A series of activities were involved in the summer camp. Special themed lectures delivered by CAO Min, TAN Ken, QUAN Rui-Chang and other professors aroused research interests among the students. XTBG Seminar provided a platform for the campers to understand academic atmosphere and international



Prof. CHEN Jin delivers an opening speech.



Pose a group photo.

exchange in the garden. Academic salon, laboratory tours, field trips, and volleyball contest all provided the campers pleasant, practical, and meaningful experiences.

On August 8, the closing ceremony was held. Mr. LI Hong-Wei issued certificates of completion for the students.

The holding of 2015 Excellent Students Summer Camp aims at promoting the exchange of ideas among the students, strengthening their understanding of botanical and ecological studies.

CUBG Environmental Education Training Course 2015

CUBG Environmental Education Training Course 2015 was held during August 3-15 in XTBG. 28 people from botanical gardens, NGOs and universities participated in the training course.

The training course was composed of lectures and practices. The lectures covered such topics as basic theories of environmental education research, investigation methods, data statistics and analysis, and literature review. Prof. CHEN Jin, director of XTBG and chairman of CUBG, delivered lectures and guided the participants throughout the two-week course. The course provided the participants a new insight into carrying out public education in botanical gardens.

The training course focused



Rhett BUTLER delivers a lecture.



Bran HOWELL leads nature education.

on the application of nature education in practice. Rhett BUTLER, editor-in-chief of Mongabay.com, and Bran HOWELL, Education Development Officer of the UK Eden Project, shared their experiences of nature education with the participants. The trainees were divided into 9 small groups to raise scientific questions, design experiments, collect and analyze data. They presented their results to the expert panel on August 15.

Team Building

New leadership of XTBG formed

New leadership of XTBG was formed on March 24. Prof. CHEN Jin continues his role as the director. Mr. LI Hong-Wei and Prof. HU Hua-Bin are deputy directors.

The appointment was released by Mr. LI He-Feng, director-general of the CAS Bureau of Personnel and Education.

Mr. HE Yan, a member of CAS Presidium, gave positive comments on the work of the former directorate members and showed gratitude to the outgoing deputy directors (Prof. CAO Min, Prof. LI Qing-Jun, and Prof. ZHOU Zhe-Kun). He encouraged the new leadership, with CHEN Jin as the director, to cooperate cordially so as to promote development of XTBG, within the framework of the “Pioneer Action Plan” of the CAS.

CAS Distinguished Professorship

Six professors of XTBG, Richard CORLETT, CHEN Jin, YU Di-Qiu, LI Qing-Jun, LIU Wen-Yao and ZHOU Zhe-Kun were granted CAS Distinguished Professorship. 900,000 Yuan was awarded in total.

Eight scientists of XTBG were approved by CAS “Light in Western China” project

After the approval of CAS Personnel Bureau, eight scientists in XTBG (XIAO Hai-Feng, LU Chuan-Li won “A category”, while CHEN Ya-Jun, LI Yang-Ping, LIU Cheng-Gang, MA Hui, TAO Yan-Bin and WANG Zheng-Wei won “B category”), were approved by CAS “Light in Western China” project, in total of 1.9 million Yuan was funded.

By the end of 2015, seventy- nine scientists in XTBG had received fundings from the “Light in Western China” project, totaling 12.24 million Yuan.





New members of Youth Innovation Promotion Association, CAS

Dr. CHEN Ya-Jun and Dr. YANG Jie were enlisted of the membership of Youth Innovation Promotion Association, CAS (YIPA). 800,000 Yuan was funded. YIPA is a non- profit youth academic organization approved by CAS in 2011. YIPA aims to bring outstanding CAS young scientists together, to improve their innovative and creative ability, thereby making more scientific contribution to CAS and China.

Two postdoctoral fellows received funding from China Postdoctoral Science Foundation

Dr. Sophie WILLIAMS and Dr. WEE Kim Shan of XTBG got funded by China Postdoctoral Science Foundation, in total of 230,000 Yuan.



Sophie WILLIAMS



WEE Kim Shan

XTBG scientists awarded by Yunnan Province

Prof. LIU Chang-Ning of XTBG was approved by the “Top-Level Scientific Talents of Yunnan Province” project in 2015.

LIU is the PI of Bioinformatics Research Group in XTBG. His research work focuses on bioinformatics of non-coding RNAs. He has published more than 25 papers in the peer- review journals, including *Nucleic Acids Research* and *Int J Mol Sci. BMC Genomics*.

According to an announcement issued by Yunnan Provincial Government, Prof. Richard CORLETT of XTBG was among the ten foreign experts who were honored with 2015 Yunnan Friendship Award. Yunnan Friendship Award was set up in 1997 by Yunnan government, which aims at praising foreign experts who have made outstanding contributions to the social and economic development of Yunnan Province in different aspects. It is the highest honor available for foreign experts in Yunnan.

In 2015, Prof. XU Zai- Fu received 50,000 Yuan for being granted “Xingdian Talent” Award.



Yunnan Governor CHEN Hao confers award to Richard CORLETT.

Dr. ZHANG Ling, Dr. LIANG Gang and Dr. CHEN Li-Gang of XTBG were enlisted of Academic & Technology Talented Reserves of Yunnan Province, in total of 90,000 Yuan was received.

New Young- Scientist Groups were set up

In 2015, two Young- Scientist Groups were set up in XTBG. The Landscape Ecology Group (LEG) with associate Prof. Alice HUGHES as the PI, and the Plant Environmental Adaptability Group (PEAG) with associate Prof. HU Yan-Ru as the PI. The LEG aims to understand ecological patterns across the landscape from a variety of different perspectives, and to achieve a holistic understanding of the factors which shape species distributions and patterns of diversity and endemism, and to use this knowledge to help develop more robust and effective conservation



Alice HUGHES



HU Yan-Ru

measures across the region. The PEAG mainly focuses on the regulatory mechanisms of phytohormone signaling and stress tolerance. Research interests include: (1) the regulatory roles of phytohormone in modulating stress responses; (2) the crosstalk mechanisms of phytohormone in stress responses; (3) the molecular mechanisms of temperature stress responses.



Senior visiting scholarship

Four professors have been granted the CAS Visiting Professorship for Senior International Scientists (visiting scholarship) for participating research work at XTBG.

Prof. Roy TURKINGTON from the University of British Columbia, has been a full professor on botany since 1990 in UBC. His research interests are plant ecology research and phenology.

Prof. David Kay FERGUSON of the University of Vienna, Austria, who is a full professor and the director of the Institute of Paleontology, his research focuses on paleobotany.

Prof. James C. NIEH from University of California-San Diego, USA, received his BA from Harvard University in 1991 and his Ph.D. from Cornell University in 1997. He completed a NSF-NATO postdoctoral fellowship at the University of Würzburg, Germany, and was a Harvard Junior Fellow from 1998-2000.

Prof. Stuart L. PIMM of Duke University, USA, is a world leader in the study of present day extinctions and what can be done to prevent them. His research covers the reasons why species become extinct, how fast they do so, the global patterns of habitat loss and species extinction and, importantly, the management consequences of this research.



Roy TURKINGTON



David Kay FERGUSON



Stuart L. PIMM



James C. NIEH

New postdoctoral fellow recruitment

Four postdoctoral fellows, Dr. Zhila HEMATI, Dr. D. BALASUBRAMANIAN, Dr. Yu ITO, Dr. HU Jin-Jin, were approved to join XTBG in 2015. Dr. Zhila HEMATI, achieved her Ph. D on botany in 2015 from University of Malaya, Malaysia, currently cooperates with Prof. YANG

Xiao-Dong of XTBG; Dr. D. BALASUBRAMANIAN, acquired his Ph. D from Rajiv Gandhi University, India, joined Prof. ZHANG Yi-Ping's research group in November 2015; Dr. Yu ITO got his Ph. D degree in Chiba University, Japan, currently cooperates with Prof. LI Jie; and Dr. HU Jin-Jin, she achieved her Ph. D degree in Kunming Institute of Botany, CAS in 2015, her cooperate Professor is ZHOU Zhe-Kun.



Zhila HEMATI



D. BALASUBRAMANIAN



Yu ITO



HU Jin-Jin



Visits

Britain's Duke of Cambridge, Prince William

Britain's Duke of Cambridge, Prince William, visits XTBG on March 4. He planted a *Dillenia indica* tree in Commemorative Plant Garden of XTBG close to the one planted by his grandfather, Prince Philip, Duke of Edinburgh when he visited with Queen

Elizabeth II in 1986.

Prince William has given a speech on conservation and illegal wildlife trade at a biodiversity conservation workshop themed

“Conservation

on the borders” in XTBG. He spoke passionately about the importance of protecting wildlife.

At the conference, the prince pointed that the illegal wildlife trade was everyone’s “common enemy” and expressed his fear that rare species, such as elephants, could be extinct in his lifetime. “We seem to be hurtling towards that tragic outcome,” he told the audience at XTBG. “The illegal wildlife



trade is therefore our common enemy. It is a vicious form of criminality: plundering the natural resources of poorer countries, taking lives, hindering development and spreading corruption” said the Prince.

The prince interacted with a group of students on their studies after his speech.

During his stay in XTBG, the prince visited the Flower Garden, Medicinal Plant Garden, Palm Garden, and Commemorative Plant Garden.

The 11th Panchen Erdeni Qoigyi Gyaibo



The 11th Panchen Erdeni Qoigyi Gyaibo, the highest ranking figure of Tibetan Buddhism in China currently, visited XTBG on June 1. XTBG CPC Secretary LI Hong-Wei showed the 11th Panchen and his companions around the living collections and introduced work in scientific research, species conservation, and science popularization. He also introduced rich tropical rainforest and rich ethnic cultures in Xishuangbanna.

Afterwards, the 11th Panchen planted a Bodhi tree (*Ficus religiosa* L.) at the Ethnic Plant Garden of XTBG.

The tour was accompanied by Mr. HUANG Yi, Standing Committee of CPC Yunnan Provincial Committee, head of the United Front Work Department of CPC Yunnan Province Committee and Mr. LUO Hong-Jiang, deputy Secretary of Xishuangbanna Prefectural CPC.

LIU Xiao-Feng

Mr. LIU Xiao-Feng, vice chairman of the National Committee of the Chinese People's Political Consultative Conference (CPPCC) and the central vice executive chairman of the Chinese Peasants and Workers Democratic Party, paid a visit to XTBG on April 14. Prof. HU Hua-Bin, deputy director of XTBG, showed the guests around the living collections and the research center of XTBG. During the visit, HU Hua-Bin briefed the guests XTBG's achievements in scientific research, species conservation, tourism and public education. Vice chairman LIU Xiao-Feng praised beautiful landscape



of XTBG. He also showed interest in the tropical plant species. He especially visited the orchid show at Shade Plant Garden and listened conservation works of XTBG on orchid. LIU Xiao-Feng also asked the living and working condition of grass-roots party members of XTBG.

ZHANG Jian-Long



With the aim of inspecting precious timber species in XTBG, Mr. ZHANG Jian-Long, director of State Forestry Administration, paid a tour to XTBG on August 21, accompanied by Mr. ZHANG Deng-Liang, Party Member of People's Government of Yunnan Province and LENG Hua, head of Forestry Department of Yunnan Province.

Mr. SHI Ji-Pu, head of Horticultural Department of XTBG showed the guests around and explained the introductory work, cultivation and other biological characteristics of some valuable timbers, such as *Pterocarpus macarocarpus*, *Pterocarpus santalinus*, *Mesua ferrea*, and *Parashorea chinensis*. ZHANG Jian-Long spoke highly of precious timbers introduction and research work of XTBG.



CHEN Hao

Mr. CHEN Hao, Governor of Yunnan Province, paid an inspection tour to XTBG on March 19. He listened to reports on scientific research, species preservation, public education, team building, and graduate education by XTBG director CHEN Jin.

Prof. CHEN Jin showed the governor and his companions around the living collections and Scientific Research Center of XTBG. CHEN Jin introduced the design conception of living collections and landscape. He also talked about development of biological industry, tourism, and community environmental education with the visiting officials.

Governor CHEN Hao gave positive comments on the work of XTBG. He encouraged XTBG to lead the development of tourism in Xishuangbanna, and make greater contribution to local socioeconomic development, especially for the elite tourism township of Menglun.

Accompanying the inspection tour were former vice Governor



LIU Ping, CPC secretary CHEN Yu-Hou and Prefecture Governor LUO Hong-Jiang of Xishuangbanna, and other local officials.

HOU Jian-Guo

Academician HOU Jian-Guo, Vice-Minister of the Ministry of Science and Technology, paid an inspection tour to XTBG on September 11. His tour was for an investigation of construction of national basic facilities and meeting representative research professors.



Prof. CHEN Jin, director of XTBG, chaired a meeting for the vice minister to talk with the professors. HOU Jian-Guo introduced the progress of formulating a plan for deepening reform of the management of science and technology initiatives (projects and funds) financed by the Central Government. He spoke

highly about the fast development of XTBG.

Afterwards, CHEN Jin showed the vice minister and his companions around the living collections and the Central Laboratory.

Other Visitors

January

- 4 Director of National Tourism Administration, Mr. LI Jin-Zao and deputy director Mr. WU Wen-Xue paid an inspection tour to XTBG.
- 7 Mr. Corrie. H. ROBB, Consul of U.S. Consulate General in Chengdu visited XTBG.
- 13 Dr. HUANG Jian-Guo of South China Botanical Garden, CAS, visited XTBG and gave a talk at XTBG Seminar.
- 14 CAS academician Prof. XU Zhi-Hong, Prof. LI De-Zhu, director of CAS Kunming Branch, Mr. WANG ding, secretary-general of Man and Biosphere China National Committee and MA Xue-Rong from CAS bureau of international cooperation visited XTBG.
- 17 Dr. YANG En-Cheng headed a 6-people delegation from Taiwan University visited XTBG.
- 26 Prof. Renee M. BORGES of Indian Institute of Science visited XTBG and gave a talk at XTBG Seminar.
- 28 Dr. Hans KERP of Westfälische Wilhelms-Universität Münster together with Prof. FENG Zhuo of Yunnan University and Prof. WANG Jun of Nanjing Institute of Geology and paleontology, CAS , visited XTBG and gave a talk at XTBG Seminar.
- 29 Mr. PENG Hong, director of Qinling National Botanical Garden headed a delegation paid an interacting tour to XTBG.
- 29 20 people from British Consulate General in Chongqing, British Embassy in Beijing, Foreign Affairs Office of Yunnan Provincial Government and Foreign Affairs Office of Xishuangbanna Prefecture visited XTBG.
- 30 18 from Taipei Botanical Garden visited XTBG.

February

- 3 Dr. Jing ZHU from Norwegian University of Life Sciences visited XTBG and gave a talk at the XTBG Seminar.
- 9 26 from 8 institutes came to XTBG to participate CUBG "Full-cover conservation plan of native plant species in China" meeting.

March

- 10 Dr. David FERGUSON from University of Vienna, Austria, visited XTBG and gave a talk at the XTBG Seminar.
- 24 Prof. HAN Yue-Peng of Wuhan Botanical Garden, CAS, visited XTBG and gave a talk at the XTBG Seminar.

April

- 7 Dr. ZHOU Dao-Xiu of University Paris-sud 11, France, visited XTBG and gave a talk at the XTBG Seminar.
- 20 Under the invitation of Prof. CHEN Jiang-Hua of XTBG, Prof. HE Guang-Cun of Wuhan University, visited XTBG and gave a talk at the XTBG Seminar.
- 29 Dr. Robert A. SPICER of the Open University, UK, visited XTBG and gave a talk at the XTBG Seminar.

May

- 13 Mr. CAO Yun-Fu, Deputy Governor of Xishuangbanna Prefecture headed a delegation paid an inspection tour to XTBG.
- 16 "International Day for Biological Diversity" brought more than 200 persons to XTBG.
- 18 Prof. Benjamin from OLDROYD University of Sydney, Australia, visited XTBG.
- 19 Dr. ZHANG Hong and Dr. SHI Hua-Zhong of Texas Tech University, USA, visited XTBG and made seminars.
- 19 Dr. Clinton N. JENKINS from Instituto de Pesquisas Ecológicas, Brazil, visited XTBG and gave a talk at XTBG Seminar.
- 26 Prof. Stuart PIMM and Dr. LI Bin-Bin from Duke University, USA, visited XTBG and gave a talk at XTBG Seminar.
- 28 20 international and domestic medias made an interview tour in XTBG.
- 31 Prof. SUN Shu-Cun from Nanjing University visited XTBG and gave a talk at the XTBG Seminar.

June

- 2 Dr. Nyi Nyi Kyaw, director general of Myanmar Forest Department headed a 5- person delegation to XTBG, under the invitation of Prof. CHEN Jin.
- 16 Dr. Catherine H. BORER from Berry College, USA, visited XTBG and gave a talk at the XTBG Seminar.
- 26 CCTV "Homeland Faraway" film crew filmed two episodes in XTBG.

July

- 11 Mr. HAO Xiang-Hong, deputy secretary of the Communist Youth League Central Network paid an inspection tour to XTBG.
- 14 Prof. Peter KOOMEN from Institute Frisian Museum of Natural History, visited XTBG and gave a talk at the XTBG Seminar.



- 27 23 people from South China Botanical Garden, Wuhan Botanical Garden and XTBG participated “Workshop on Three Garden Development Strategy”.
- 28 Dr. Rob EFIRD from Seattle University visited XTBG and gave a talk at the XTBG Seminar.

August

- 3 ZHANG Jie, deputy director of the China TV Drama Production Center headed a delegation visited XTBG.
- 3 CUBG Environmental Education Training Course 2015 brought 28 people from botanical gardens, NGOs and universities participated in the training course in XTBG.
- 3 Hunan Satellite TV “Finding the Truth” camera crew filmed in XTBG.
- 4 Prof. TANG Hong-Zhen and 5 other researchers from Guangxi University of Chinese Medicine visited XTBG to discuss about research on ethno medicine.
- 4 Dr. Rhett BUTLER, the founder and editor of Mongabay.com, visited XTBG to lecture CUBG Environmental Education Training Course, and gave a talk at the XTBG Seminar.
- 11 Dr. Maria Catarina HOORN of University of Amsterdam, the Netherlands, visited XTBG and gave a talk at the XTBG Seminar.
- 18 XTBG senior visiting scholar Prof. James NIEH of University of California, San Diego, USA, visited XTBG and gave a talk at the XTBG Seminar.
- 26 Prof. XUE Tian, executive director of the School of Life Sciences, USTC, and Mr. CHENG Wei-Hua, director of Environmental Protection Bureau of Yuexi County, Anhui Province, headed a 9- person delegation visited XTBG, and discussed co-build undergraduate internship basement.
- 30 LIANG Nai- Shen of National Institute for Environmental Studies, Japan, headed a delegation visited XTBG and carried out a CAS-JSPS international cooperation program.

September

- 3 Dr. David S. WILCOVE of Princeton University visited XTBG and gave a talk at the XTBG Seminar.
- 15 Dr. Roy TURKINGTON of the University of British Columbia visited XTBG and gave a talk at the XTBG Seminar.

- 27 50 people participated the International Workshop on Forest Canopies in XTBG.
- 29 Prof. WENG Yi-Qun of University of Wisconsin visited XTBG and gave a talk at the XTBG Seminar.
- 30 Prof. ZENG Ji- Ye of the National Institute for Environmental Studies, Japan, visited XTBG and gave a talk at the XTBG Seminar.

October

- 13 Dr. John ASCHER of National University of Singapore visited XTBG and gave a talk at the XTBG Seminar.
- 30 Dr. Benoit GUENARD of Hong Kong University visited XTBG and gave a talk at the XTBG Seminar.

November

- 2 Prof. Lars O. HEDIN of Princeton University visited XTBG and gave a talk at the XTBG Seminar.
- 4 Mr. ZHONG Mian, the vice secretary of Yunnan provincial committee of the CPC headed a delegation to XTBG.
- 16 Prof. Dinshaw J. PATEL of Memorial Sloan-Kettering Cancer Center, USA, visited XTBG and gave a talk at the XTBG Seminar.
- 17 Prof. Conrad C. LABANDEIRA of Smithsonian Institution National Museum of Natural History, visited XTBG and gave a talk at the XTBG Seminar.
- 25 Mr. MA Yang, deputy director of CAS Beijing Division, Mr. DONG Wei-Feng, deputy director of CAS Personnel Bureau, and Mr. ZHOU Jie, CPC secretary of CAS Kunming Division paid an inspection trip to XTBG.

December

- 2 Prof. LI Yi-Ming of Institute of Zoology, CAS, visited XTBG and gave a talk at the XTBG Seminar.
- 4 Dr. Calum BROWN from University of Edinburgh, UK, visited XTBG and gave a talk at the XTBG Seminar.
- 14 Prof. CHE Jing of Kunming Institute of Zoology, CAS, visited XTBG and gave a talk at the XTBG Seminar.
- 17 Prof. Darren MOSELEY of Forest Research, Edinburgh, UK, visited XTBG and gave a talk at the XTBG Seminar.



Financial Review

Photo by XU You-Kai

Income and Expenditure (Million Yuan)

	Categories	FY 2013	FY 2014	FY 2015
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INCOME

	Government Grants	47.716	46.593	49.974
	Infrastructure	0	0	0
	Admissions & Services	56.197	55.635	82.277
	Research Grants	109.232	94.619	66.777
	Miscellaneous	0.747	1.047	2.374
	Sum	213.892	197.894	201.402

EXPENDITURE

	Staff Costs	89.739	91.370	104.629
	Maintenance	5.669	3.277	4.329
	General and Admin. Expense	7.088	5.059	1.627
	Infrastructure	0	0	0
	Equipments	65.920	48.998	26.256
	Research & Horticulture	34.768	47.797	76.675
	Miscellaneous	0	0	0
	Sum	203.184	196.501	213.516



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Photo by LIU Guang-Yu

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XISHUANGBANNA TROPICAL BOTANICAL GARDEN, CHINESE ACADEMY OF SCIENCES

Headquarter
Menglun, Mengla
Yunnan 666303, P. R. China
Tel. + 86 691 8715460
Fax. + 86 691 8715070

Kunming Division
88 Xuefu Road, Kunming
Yunnan 650223, P. R. China
Tel. + 86 871 65171169
Fax. + 86 871 65160916

www.xtbg.cas.cn



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Editor: ZHANG Wei
Translated by: AI Chong-Rui, ZHANG Wei, HE He, SHI Ji-Pu, WANG Li, *etc.*
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