Important Plants of East Asia

: Plants tell stories

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Arctic tundra

In East Asia, forests stretch from their northern limit at the boundary with the tundra in the Arctic, along the coast of the Pacific, to lush tropical forests. These forests form an uninterrupted green belt that separates humid coastal areas of the Pacific from the permanently arid areas of Mongolia.

In the far north, the forest is dormant for at least several months of the year and blanketed in winter snows. Tropical areas are always warm, but are still seasonal because of the influence of the Asian monsoon. Wide variations in humidity, temperatures, longevity of growing season and amount of precipitation create a great diversity of ecological conditions supporting alder, dwarf-pine, birch, spruce, fir, hardwood humidity-dependent forests, sclerophylle woodlands and deserts that accommodate biota with different evolutional histories and adaptation strategies. In this study, we focused on different aspects of life and investigated how species live and share the resources of this large region, as well as how they survive the harsh and changing environment and increasing anthropogenic impact.

From the great aridization in the Pleistocene to the present area, vegetation in East Asia has been subjected to transitional dry and humid conditions from the Arctic to tropical zones. Migrations of the drought-tolerant Central Asian species have enriched the derivates of ancient boreo-nemoral (Arcto-Tertiary) ecosystems, which occupied niches vacated by humidity-dependent species during a very short period of drought in the growing season. Therefore, moisture in northern Asia has been the most important resource to rainforests in the last 2.5 million years. Humid oceanic regions in every biogeographical realm as well as elevated habitats in montane areas are able to provide conditions that support the longest uninterrupted latitudinal forest gradient on the Pacific coast, which varies from subarctic dwarf forests to tropical forests.

East Asia is an area of over 20 million km^2 ranging from 20° N to 73° N latitude and 169° W to 90° E longitiude. This region has many contrasts in terrain, climate and vegetation. The terrain of the area varies from the worlds largest plains to extensive mountain systems as high as 8000 m above sea level. In addition, five of the 10 largest rivers in the world occur in this region; namely, the Yanze, Huanhe, Ob', Mecong, Amur, and Lena, which deliver fresh water from the center of Asia to the Arctic and Pacific oceans and cross the entire region, uniting it as one great ecosystem. The ba-

Subarctic woodlands

sins of the great rivers are bordered by well distinguished mountain chains, such as the Ural Mountains, Altai, and the great Tibetan Plateau, which create very large and well intergated ecosystems at a continental scale.

>> Climate

Oceans, extensive land masses, great plains and mountains lead to diversity in climates. Two basic climatic gradients are characteristic for East Asia. The wide latitudinal range results in major climatic changes, from the Arctic zone in the north to the tropical zone in the south. The location near the Pacific Ocean causes another continental climatic gradient. The climate of the oceanic islands have cold summers and mild winters. In the continental interior, the climate is ultra-continental, with very cold winters (absolute minimum −71.2°C at Oimyakon) and warm summers (absolute maximum 43°C at the same location). The climatic differences cause changes in vegetation that are expressed from north to south as a sequence of phytogeographical zones: polar deserts; tundra; dwarf-pine woodlands; boreal forests; temperate deciduous broad-leaved forests; grasslands; deserts; and evergreen broad-leaved forests. The area is subdivided into five continental sectors: (1) suboceanic; (2) maritime; (3) sub-maritime; (4) continental; and (5) ultra-continental. Vegetation in each continental sector reflects the change from damp, relatively seasonal, even oceanic climates near the coast to dry, seasonally contrasting climates in the interior. As a result, there are two major climatic forces controlling vegetation distribution in East Asia, namely humidity and heat.

>> Flora and vegetation

Two of the six floristic kingdoms on Earth contribute to the formation of terrestrial flora and vegetation of East Asia. Within the region, extremes of climate and an extraordinarily complex geological history have led to one of the most diverse assemblages of living organisms on the planet. There are good biogeographical reasons as to why the unique taxonomic history and ecological complexity of the East Asian flora continue to attract the attention of life scientists worldwide. East Asia includes the world's longest continuous latitudinal gradient (> 60° N to > 55° S) of vegetation, stretching from the Arctic to the southern tip of the tropical Malaysian peninsula in Asia. Many of the so-called living fossils that reflect the evolutionary history of the

Boreal forests

Earth's biota are found in East Asia. The flora of the region has not only served as an intergenerational focus for scientific study, but continues to inspire original concepts and principles that have a resounding impact on science. Over the centuries, researchers have been captivated by the unique diversity of East Asia and the intricate web of evolutionary relationships between humankind and plants. Apart from natural evolutionary processes, human culture is one of the most significant determinants of modern vegetation that, when combined with natural processes in Pacifica, is unique within a global context.

Temperate deciduous forests

The vegetation of this territory changes from polar deserts, which have scattered or no plants at all, to diverse mixed forests of evergreen broadleaved trees in the south. Six broad vegetation zones transitionally change from north to south. The Arctic deserts, occurring on Wrangell and Gerald Islands, are replaced southward by a tundra zone along the Arctic coast, including the entire Chukotka Peninsula. East of the Kolymskiy range is the zone of Beringian woodlands, which is very specific to northeasternmost Asia. The main vegetation type of this zone is low (6 m) Siberian dwarf-pine forest. The boreal zone occurs from 43° N (southern mountains) to almost 70° N, occupying nearly 40% of this area. The dominant vegetation type is larch forest, which is replaced by pine, fir and spruce in southern and western Siberia and the lower Amur basin or by Ermann stonebirch on the Kamchatka Peninsula. At about 46–50° N, the boreal zone gradually changes to the temperate zone, which is represented by mixed deciduous and evergreen forests near the Pacific coast and by steppe and desert in the interior. A subtropical zone lies between 22° N and 27° N, in which warm temperate evergreen broadleaved forests are enriched with tropical species. Most vegetation in northern Asia balances at the edge of water deficit. Forests that occur year round under humid conditions are concentrated along the coasts and at high elevations.

According to the arid areas of East Asia, the north to south distribution of vegetation zones corresponds well with the distribution of precipitation. For instance, in case of Mongolia, the following main vegetation zones, which distributed in sequence from the north to the south, namely: mountain taiga forest, forest-steppe, steppe, desert-steppe or semi-desert and desert zones. The altitudinal zonation of the Mongolian mountains is briefly as follows. In the montane belts of northern Mongolia distributed boreal forests and meadows. The lower montane forests consist mainly Siberian larch (*Larix sibirica*), and the upper montane forests mainly compose by Siberian pine (*Pinus sibirica*). The hill belt in northern Mongolia hosts grassland or steppes, whereas in the mountains around the large lake basins in the west of the country occurs

dry steppes and semi-deserts. In the southern Mongolia present semi-deserts and deserts. Vast areas of Central Asia, particularly the central and eastern regions are covered with steppe, where dominated species of the genera *Stipa*, *Festuca*, *Cleistogenes*, *Agropyron*, *Koeleria*, *Poa*, *Elymus* etc. Extensive stretches of the semi-desert with shrubs and bushes are found in the southwestern, southern and southeastern Mongolia. The shrub, *Caragana leucophloea* and *Eurotia ceratoides* are participate in the semi-desert plant communities together with other shrubs or herbs, such as *Calligonum mongolicum*, *Atraphraxis frutescens*, *A. pungens, Stipa glareosa*, *Artemisia herophytica*, *A. xanthochroa*, *Oxytropis aciphylla* etc. Important vegetation components of the deserts include low shrubs, semi-shrubs and herbs, such as *Anabasis berifolia*, *Sympegma regelii*, *Haloxylon ammodendron*, *Calligonum mongolicum*, *Convolvulus ammanii*, *Anabasis brevifolia*, *Reamuria soongorica* etc. (Written by Badamdorj Bayartogtokh)

>> Vegetation history

Vegetation history is very useful to understanding modern patterns in the distribution of biota in this region. The modern flora is formed on the basis of the ancestrial boreo-nemoral (Arcto-Tertiary) flora that occupied extensive areas in the temperate and polar latitudes of the Northern Hemisphere during the Tertiary period. Many authors explain the species richness and high diversity of rain forests of northern Asia by the fact that these areas have been unaffected by glaciation throughout the Pleistocene, or at least since the high temperatures reached during the Pliocene optimum. Most of the present species constituting the modern communities had ancestral taxa in the Tertiary palaeofloras of the Late Miocene and Pliocene. The vegetation of the maximum stage during the last glacial period in northern East Asia consisted of drought-tolerant meadows and larch woodlands on the plains and dark-conifer taiga in the lower mountain belts. During the subsequent warming, broadleaved temperate species invaded this territory from warmer and wetter regions in the south.

Most palaeobiologists reconstructing vegetation dynamics in the Pleistocene and Holocene agree in distinguishing the following stages of vegetation development. The Pleistocene glacial maximum 18,000 years BP is characterized by the lowest temperatutes and humidity. Nearly all of the northern part of East Asia was occupied by grass and tundra dwarf shrubs that have no known analogs at present. Woods only remained in refugia along the Pacific coast due to the mild climate formed by oceanic air masses. Climatic fluctuations in the Pleistocene were responsible for the repitation of cold and warm periods, but, in contrast to other

Evergreen broad-leaved forests

regions of the Northern hemisphere, most of this area was never covered by the ice shield, and vegetation has had uninterrupted its development since the tertiary. The cold aridic climate in the Asian interior in combination with marine regression caused the formation of land bridges between Asia and America (Bering land bridge) and between the island arcs and the continents that enabled migration of many drought-tolerant plants. Humidity-dependent vegetation could survive Pleistocene aridization in refugia, which could retain moisture due to mountain systems that faced the seas.

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Steppes and deserts

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Warming and increasing humidity in the Holocene led to expansion of thermophilic and humidity-dependent species from refugia and to contraction of ranges of xeric species that invaded the area during Pleistocene aridization. At 5,000–6,000 years BP, nemoral vegetation reached its maximum distrtibution. This period was likely the time of formation of rain forests in their modern appearance. The climatic condition of the last 5,000 years is characterized by strong fluctiations in temperature and moisture regimes, but has a general trend of cooling and drying. Many forest dominants retreated from the northernmost portion of their distribution, after which they were replaced with cold tolerant forests enriched with nemoral species

>> Studies

Studies in such areas, including reconstructions of vegetation history in climatically contrasting periods, have already contributed significantly to understanding the patterns and processes of the formation of regional floras. Relictual and endemic species deserve much more attention beyond species lists, as well as highly speculative interpretation of their ecological and floristic relationships.

We currently have little historical information regarding the complex adaptations of relictual plant species; however, such information may be very important for understanding and forecasting the responses of plants to global change. There are still major deficiencies in our ability to model the optimal conditions for the development and establishment of relict species and their genetically related relatives, to reconstruct their paleodistributions, and to understand how their main migration routes are linked to the chronological scale.

In summary, a major purpose of this book is the removal of artificial, man-made boundaries, wherever they exist in the plant world. This book is not intended to simply present a set of species that deserve to be mentioned owing to their attractiveness, rarity or endemic status. Rather, we hope this book will stimulate wide-ranging discussion, and invite researchers to hear the stories behind each plant species in order to better understand the way of the plant.

Written by Pavel V. Krestov

100 Species Stories of East Asia

Abeliophyllum distichum Nakai

Oleaceae

- 미선나무
- Абелиелистник двурядный

Abeliophyllum Nakai is a monotypic genus endemic to Korea in Oleaceae (olive family). The species was first found in rocky slopes in Mt. Gunjasan, Chungcheongbuk-do province, in the central part of South Korea. The species is characterized by sympetalous flowers (fused petals), longitudinally rolled-up petals, out-arranged stamens, and winged fruits (Nakai, 1919; Lee and Kil, 1991; Lee, 2006; Kim, 2007). Only eight natural, native habitats have been found in central and southern provinces of Korea (Gyeonggi-do, Chungcheongbuk-do, Gyeongsangbuk-do, Jeollabuk-do), and five of these are designated as a Korea National Monument (Lee and Kil, 1991; Kim and Kim, 2008). *Quercus variabilis*, *Q. serrata*, *Zelkova serrata*, *Prunus sargentii*, *Spiraea prunifolia* var. *simpliciflora*, *S. blumei*, *Callicarpa japonica*, *Grewia biloba*, *Stephanandra incisea*, and *Rubus coreanus* are also found in *Abeliophyllum distichum* natural habitats (Lee and Kil, 1991).

Written by Gyu Young Chung & Kyong Sook Chung

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Description

Shrubs deciduous, 1 m tall. Stem tips dropping (nodding or bending), purplish. Leaves opposite, 2-ranked, ovate to elliptic-ovate, 3–8 cm long, 0.5–3.0 cm wide, margins entire. Flowers on 2-years-old twigs, blooming before new leaves appear, 3.0–3.5 mm long. Calyx 4-lobed, ovate, apex notched, earlier convolute. Corolla 4-lobed, white or light pink, longer than calyx. Stamens 2, attached to the base of floral tubes. Samaras ovate-elliptic, ca 25 mm long, apex notched, bases widely acute, 2-seeded. Fl. Mar–Apr, fr. Apr–May.

Distribution

Endemic to Korean Peninsula [Gyeonggi-do, Chungcheongbuk-do, Gyeongsangbuk-do, Jeollabuk-do]

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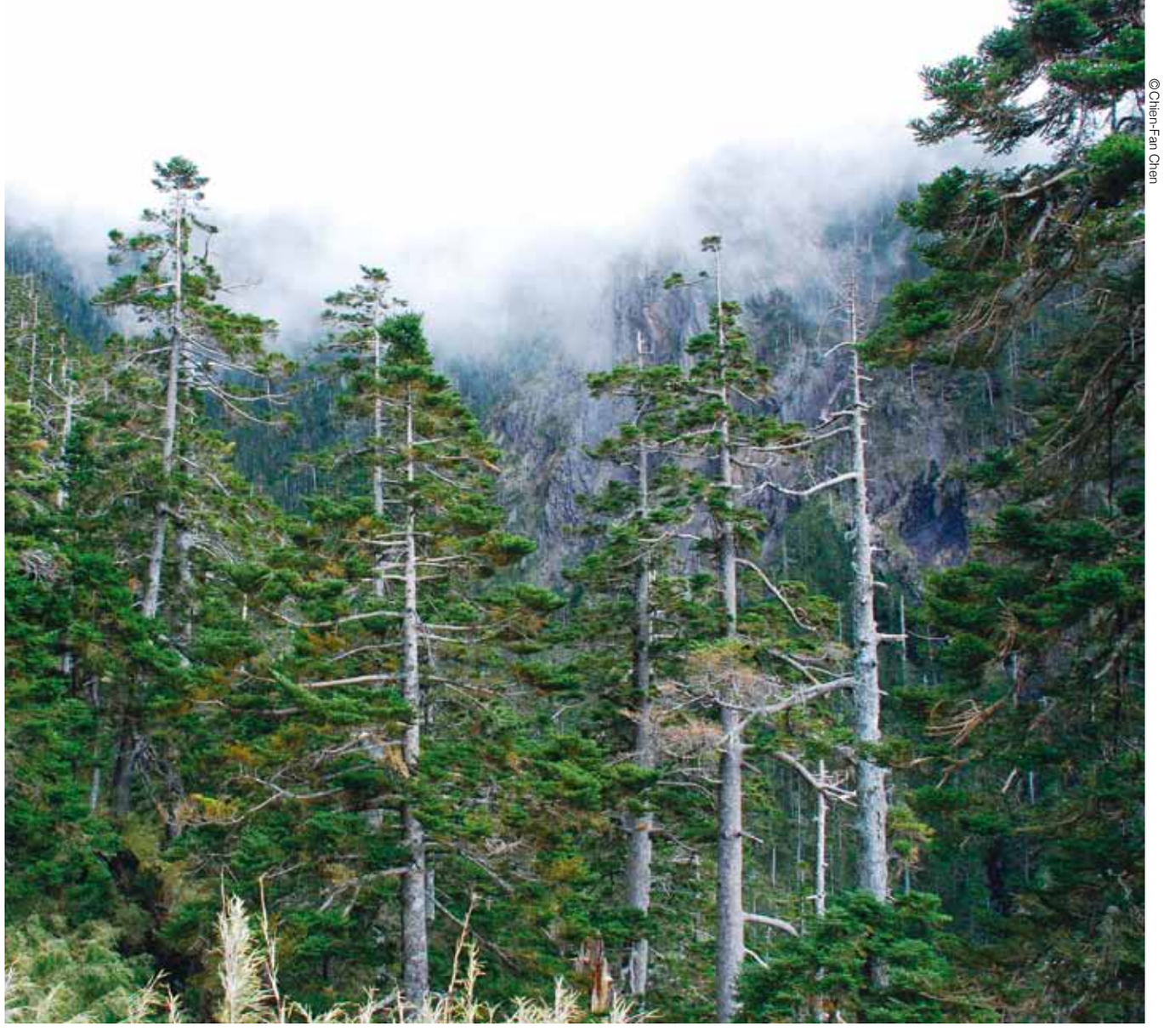
Abies kawakamii (Hayata) Ito

Pinaceae

- 台湾冷杉
- Пихта Каваками
- 臺灣冷杉



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Description

Trees coniferous, evergreen, 16 m tall. Bark grayish brown, scaly. Branches horizontal. Leaves spreading in two ranks, broadly linear, 10–15 mm long, 3–4 mm wide, midrib prominent, apex rounded-obtuse. Staminate strobili cylindrical, 15–20 mm long. Cones erect, cylindric or oblong, peduncled, 5.0–7.5 cm long, 4 cm in diam., purplish; scales fan shaped, 15–18 mm long. Seeds obdeltoid, 18 mm long including the wing.

Distribution

Endemic to Taiwan Islands [at high altitudes of about 2,400–3,900 m in the central range]

Taiwan Fir is a glacial relic conifer species endemic to Taiwan Islands distributed in high mountain areas. The species grows densely, usually forming pure stands known as "black forest" locally. Taiwan Fir's distributed upper limit is the "forest limit", forming a conspicuous boundary between the Taiwan Fir pure stand and Yushan Can (*Yushania niitakayamensis* (Hayata) Keng f.) or other shrub species. The boundary has been affected by forest fires, weather conditions, and anthropogenic disturbances.

This species is considered sensitive to climate change; therefore, a dynamic plot of Taiwan Fir has been established in Hehunshan, central Taiwan, to monitor the effects of global climate change on the alpine ecosystem. The preliminary results show that Taiwan Fir tends to expand to the population of Yushan Can. Scientists predict that it will migrate to upper area under global warming and increasing temperature.

Written by Chien-Fan Chen

Taiwan Fir was placed under the subsection *Homolepides* by Farjon (2010) and is closely related to *A. homolepis* Siebold & Zucc. and *A. recurvata* Mast., which are distributed in Japan and China, respectively.

Abies koreana E. H. Wilson

Pinaceae

- 朝鲜冷杉
- 구상나무
- Корейская пихта

Abies koreana is only distributed in the southern parts of the Korean Peninsula and the subalpine areas of Jeju-do Island located in the East China Sea, between Korea and Japan (Lee and Hong, 1995). The largest population on the island is formed in the high elevation of Mt. Hallasan, while it grows near mountain tops and in mountain inclines and ridges on the mainland, forming small populations in sunny habitats in Mt. Jirisan, Mt. Youngchuksan, Mt. Geumwonsan, Mt. Baekunsan, Mt. Deogyusan, and Mt. Gayasan (Lee and Hong, 1995). The genus *Abies* Mill. comprises 40 species worldwide, mainly in the Northern hemisphere, specifically in Asia, North America, and Europe. Fossil data revealed that many species in the genus diversified from the late Mesozoic to early Cenozoic era (Miller, 1976; Chang et al., 1997). *Abies koreana*, unlike the closely related species *A. nephrolepis* (Trautv. ex Maxim.) Maxim., has cones with backward bent scales. However, because species identification without cones is impracticable and the locations of stomatal resin bands on the leaves are variable, species identity including delimitation and endemism is problematic. In habitats shared by *Abies koreana* and *A. nephrolepis* on Mt. Deogyusan, Mt. Jirisan, and Mt. Gayasan, the morphological variations of the species are inferred to be hybrids and genetic derivatives of these two species (Chang et al., 1997). Isoda et al. (2000) implied that *A. veitchii* and *A. sachalinensis* in Japan are closely related to *Abies koreana*. These plants are boreal forest plants, with *A. nephrolepis* being found in the middle parts of Korean Peninsula, northeast China (Hebei, Heilongjiang, Jilin, Liaoning, and Shanxi), and east Russia, *A. sachalinensis* in S Kurile Island, SW Sakha-lin, Japan (Hokkaido) and *A. veitchii* in Japan at high elevations in Honshu and Shikoku (Bobrov et al., 1968; Ohwi, 1984). Further research is needed to understand the phylogenetic relationships among these species.

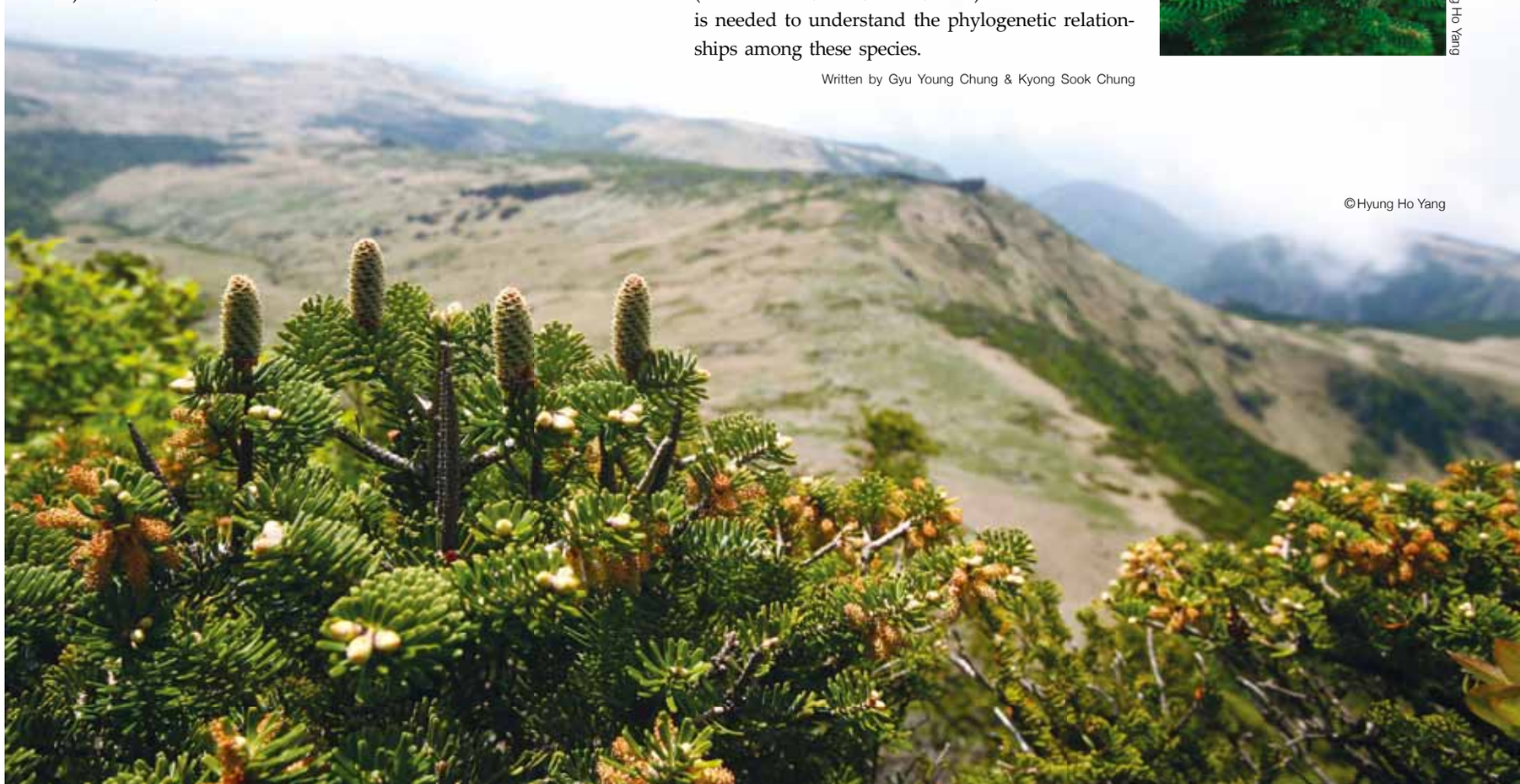
Written by Gyu Young Chung & Kyong Sook Chung

Description

Trees coniferous, evergreen, 18 m tall. Leaves spirally arranged, oblanceolate-linear, tips divided in two, notched, dark green above, silver-white below, resin ducks outer side of the upper surfaces, two white stomatal resin bands below. Monecious. Staminate strobili ellipsoid, ca. 1 cm long. Carpellate strobili usually purple, about 1.8 cm long. Cones cylindrical, 4–6 cm long, 2–3 cm in diam., greenish brown or purplish brown. Seeds egg-shaped, winged. Fl. May–Jun.

Distribution

Endemic to Korean Peninsula [Gyeongsangnam-do, Jeollabuk-do, Jeollanam-do, Jeju-do]

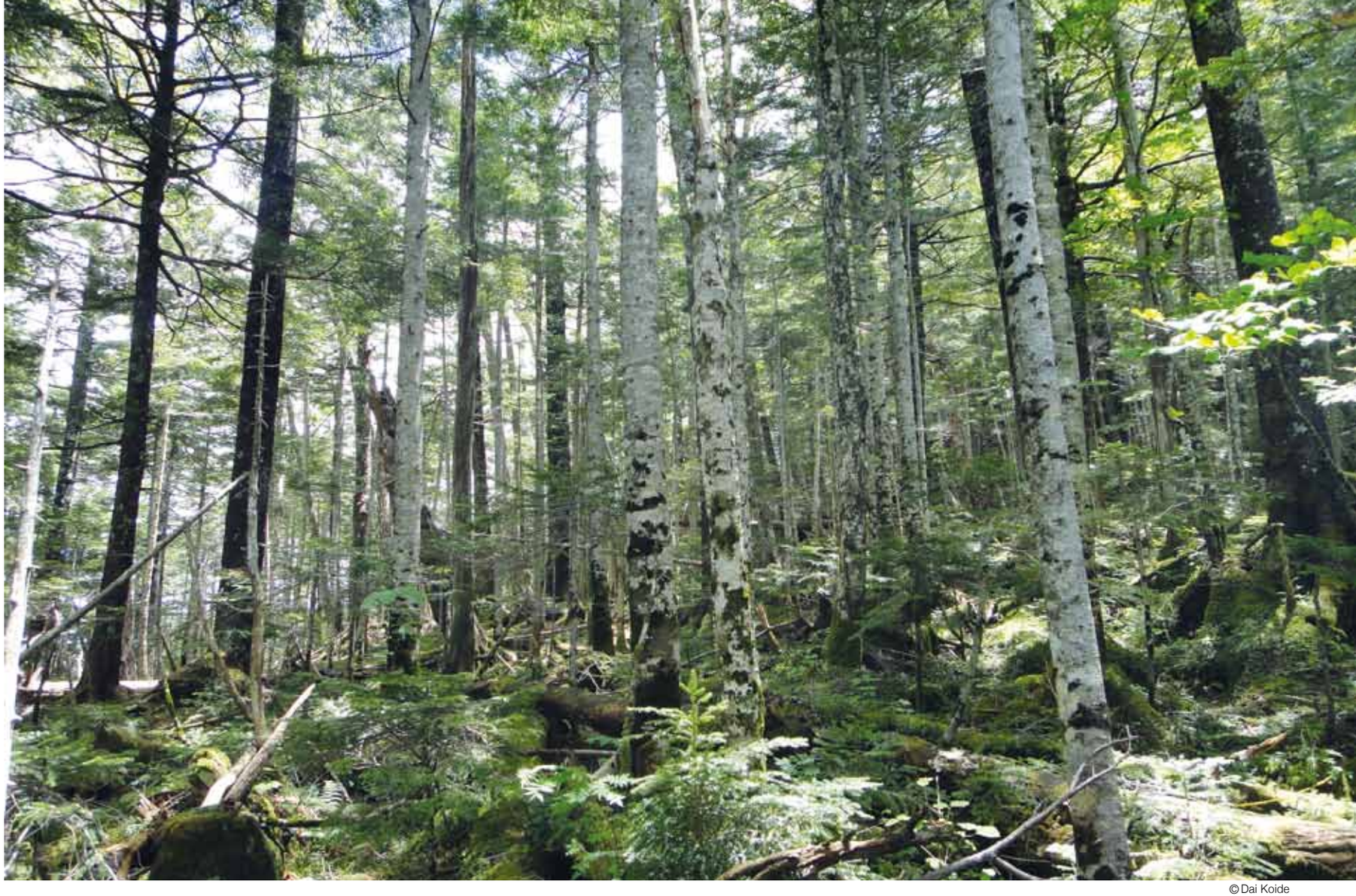


Abies mariesii Mast.

Pinaceae

オオシラビソ

Пихта Мариса



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Description

Trees coniferous, evergreen, 25–30 m tall, 80-90 cm in diam. Leaves needles, 1.5–2.0 cm long, 2.5 mm wide, flattened, apex emarginate or obtuse, two broad white bands of stomata below. Staminate strobili short, reddish to yellowish. Carpellate strobili ellipsoidal, 6–9 cm long, 3.5–4.5 cm wide, dark purple; bracts hidden. Seeds 6–10 mm long, slightly longer than wings.

Distribution

Endemic to Japanese Archipelago [central mountains to northernmost mountains: Mt. Hakkoda in Honshu Island]

This species dominates sub-alpine coniferous forests, forming pure forests in northern regions but mixed forests with *Abies veitchii*, *Picea jezoensis* var. *hondoensis* and *Tsuga diversifolia* in southern mountains. Among fir species, *A. mariesii* belongs to a phylogenetically older clade and is not close to the other four Japanese fir species nor Chinese species, but is close to a North American species (*A. amabilis*). *Abies mariesii* is highly tolerant of snow pressure and has strong mast seeding behavior. Despite the predominance of sub-boreal conifer forests in the last glacial maximum (about 21,000 years ago), large fossils of *A. mariesii* have not been recorded in this era. Considering the species prefer a wet and snowy climate, this fir is expected to be a minor species in this era, but might have expanded its distribution during the following warm era. The low genetic diversity of this fir to other fir species, especially in its northern margin, could be explained by its historical background.

Written by Dai Koide

© Shenhua Qian

Aconitum austrokoreense Koidz.

Ranunculaceae

세뿔투구꽃

Аконит южнокорейский

Aconitum austrokoreense grows in leaf mold rich, moist, shady habitats in Gyeongsangbuk-do province and/or the southern part of the Baekdudaegan such as Mt. Jirisan and its adjacent areas, but occurs in restricted, narrow areas (Lee, 1996; Park, 2007). *Aconitum* L. is composed of ca. 300–400 species and distributed in North America, Europe, and North Africa, with the greatest species diversity in the Asian temperate and Arctic regions of the Northern hemisphere (eastern Himalaya, southwestern China, and Japan; ca. 250 species with 166 endemics) (Tamura, 1993; Suh et al., 1997; Im and Park, 2001; Li and Kadota, 2001; Yan et al., 2005; Park, 2007). *A. austrokoreense* belongs to *Aconitum* subgen. *Aconitum* characterized by perennials, with obconic-shaped thickened roots (Lee, 1980). In the subgenus, the species is distinct based on having undivided leaves on the upper part of the stems and five to seven angled leaves (Lee, 1980). Among the closely related species to *A. austrokoreense*, *A. jaluense* is found in central and northern parts of South Korea, northern parts of China including Manchuria, Japan, and Russian Far East. *A. fischeri* var. *arcuatum* (Maxim.) Regel grows in the northern parts of Korea (Hamgyeongbuk-do, Hamgyeongnam-do, Pyeonganbuk-do), northeastern China, and Russia (Sakhalin and Ussuri) (Park, 2007). *Aconitum* species in Korea are derived from species that dispersed eastward during glacial periods in the Cenozoic era, and the genus in Korea exhibit southern distributions.

Written by Gyu Young Chung & Kyong Sook Chung

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Description

Herbs perennial, 60–80 cm tall. Stems erect, not branched. Leaves simple, triangular or pentagonal, 3 (5)-lobed, margin dentate. Cauline leaves 5-parted, each lobes rhombic, margin overlapped, dentate. Racemes axillary, galeate. Corolla light blue; peduncles pubescent. Calyx hairy; upper sepal 1, hood shaped, helmet-shaped; lateral sepals 2, round; basal sepals 2, elliptic. Stamens numerous. Pistils 3–4. Follicles 3-parted, long ellipsoid, stigmas reclined, outsides somewhat hairy. Fl. and fr. Sep.

Distribution

Endemic to Korean Peninsula [Gyeongsangbuk-do, Gyeongsangnam-do, Jeollanam-do]

©Hyung Ho Yang

Adiantum reniforme var. *sinense* Y. X. Lin

Pteridaceae

荷叶铁线蕨

Адиант почковидный китайский

© Hongwen Huang

Description

Small herbs 5–20 cm tall. Rhizomes short, erect, brown, with lanceolate scales and multi-cellular vilous at apex. Fronds clustered, stipes 3-14 cm long, dense with scales villose at the bases. Lamina only one terminal pinnule, orbicular or elliptic-reniform, 2–6 cm wide, dark green, deep or shallow sinus at joint position of stipes adaxially, sparse brown multicellular villous abaxially, base cordate, margins obtusely crenate, veins radiate. Stipes dark castaneous, 3–14 cm long, 0.5–1.5 mm in diam., lanceolate scales and multicellular vilous at base. Fertile lamina margin revolute as pseudo indusia, deep brown, membranous, sori many, orbicular or subrectangular. Fertile period. Jul–Sep.

Distribution

Endemic to Mainland China [Sichuang (Three Gorges area: Wanzhou, Fuling, Shizhu)]

Zhang (2012) elevated this variety to a distinct species. However, it was revived in 2013 on Flora of China Vol. 3. This variety is morphologically close to the original variety distributed on Atlantic Ocean Islands, but the number of chromosomes differs at times. It is very different from another variety, *A. reniforme* var. *asariforme* (Willd.) Sim., which is distributed in the African mainland, Madgascar and Maritius. Gregarious on rocks with shallow soil or in cracks of rocks or shrubs at 80–430 m above sea level, commonly 170–250 m. Endemic to the Three Gorges area, a long narrow zone along the Changjiang River. This species is endangered in its native habitat due to construction of roads, collection for medicinal use, and especially construction of the Three Gorges Dam. It is on the Chinese red list as a 2nd grade conservation species. It is now conserved *ex situ* in Wanzhou of Chongqing, Wuhan Botanical Garden, and Yunnan. The species has been used as a medicinal herb for more than 100 years and is also a good ornamental plant.

Written by Hongwen Huang

Adonis mongolica Simonov.

Ranunculaceae

- 蒙古金盏花
- Монгол хундгана, Алтан хундага
- Адонис монгольский

©N. Ochgerel

Description

Herbs perennial, 10–20 cm tall. Stems branched. Rhizomes thick, 4–7 cm long. Basal and lower cauline leaves usually scaly. Leaves two-three times pinnatisected, ultimate segments ovate or rhomboid. Flowers bisexual, snow white, large, radial symmetric. Sepals 5–8, violet. Petals 11–12. Stamens numerous, filaments linear. Pistils numerous, spirally arranged. Ovary 1-ovuled. Achenes usually ovate. Fl. Jun-Jul.

Distribution

Endemic to Mongolia [Hovsgol, Khangai, Mongol Daguur, Middle Khalkha phytogeographical regions]

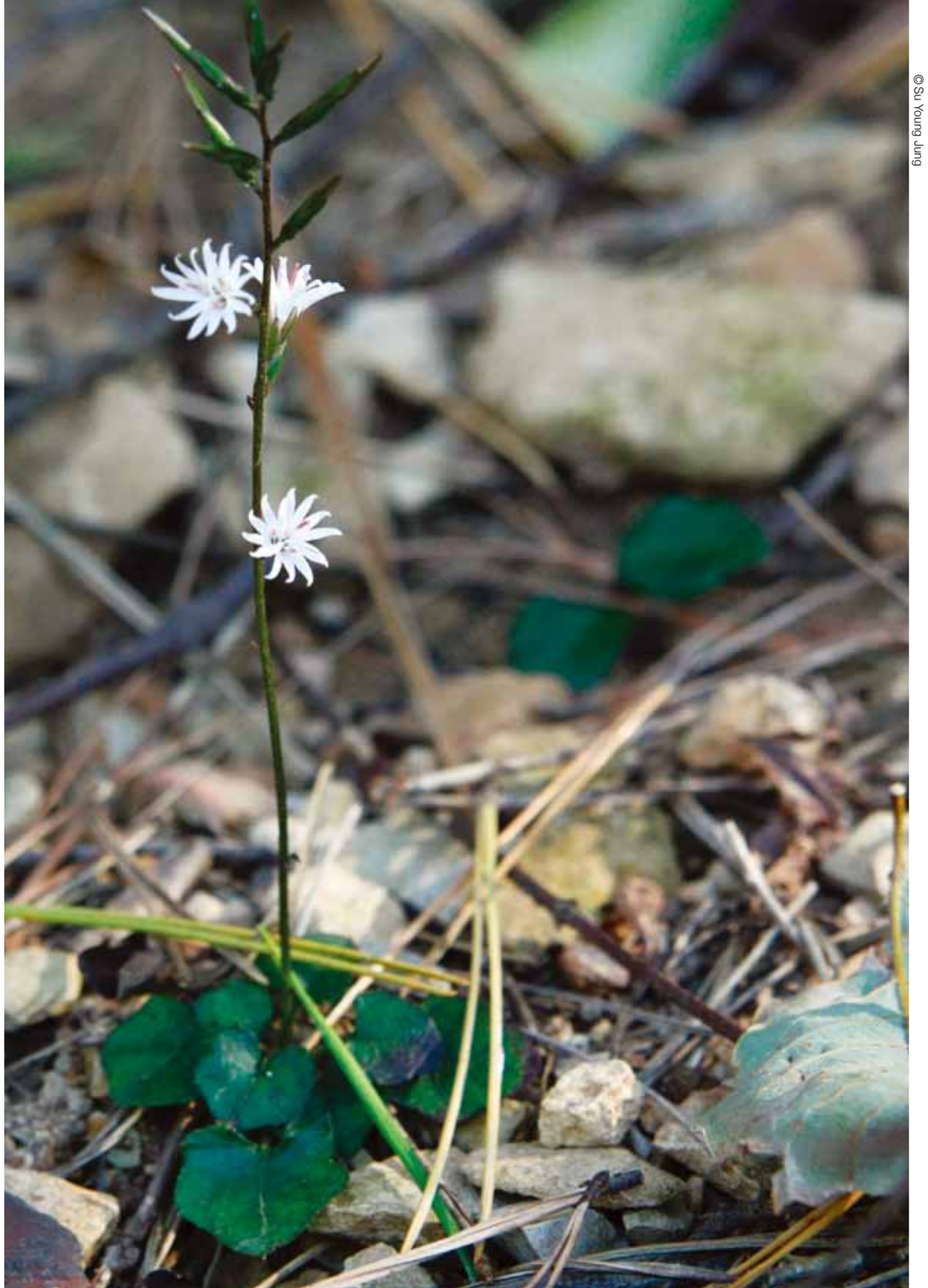
The entire plant contains the cardiac glycosides adonidosine, adonitoxine, and adonivernoside, which are toxic in high doses. The plant is used to treat weak cardiac action, especially when associated with nervous symptoms, and to compensate for arrhythmia and circulatory failure. Diuresis is increased by its action on the heart and kidneys. *Adonis* is valuable for treatment of nervous heart disease and hyperthyroidism via slowing the pulse in tachycardia. Febrile infections with tachycardia are also positively affected. In addition to its sedating effects on the heart and circulation, it slows down the pulse and has a calming effect on the fear and restlessness that accompany heart disease. This had led to its use in treatment of epilepsy, chorea minor and whooping cough. Toxic doses cause constriction of the peripheral arterial system, increasing the blood pressure and causing cardiac arrhythmia, nervous excitement, vomiting, stomach pains and diarrhea. The dried plant is still sometimes a component of herbal infusions used to improve heart function and circulation. It is further prescribed by physicians as a standardized medicine.

Written by Magsar Urgamal

Ainsliaea apiculata Sch. Bip.

Asteraceae

- キッコウハグマ
- 좀딱취



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Description

Herbs perennial, evergreen, 8–30 cm tall. Stems pubescent, simple or branched. Leaves long petiole, ovate, cordate or reniformed, 1–3 cm long and wide, both sides hairy, shallowly 5-lobed. Heads arranged in spikes, white, short pedicel; involucre 10–15 mm long, phyllaries 5-seriate; outer phyllaries ovate, 1 mm long; inner phyllaries linear. Achenes 4.5 mm long, pubescent, flat, obovated. Fl. Aug–Oct, fr. Oct.

Distribution

Korean Peninsula [Chungcheongnam-do, Gyeongsangnam-do, Jeollabuk-do, Jeollanam-do, Jeju-do], Japanese Archipelago [Hokkaido, Honshu, Shikoku, Kyushu]

This species occurs in Japanese Archipelago (mainland and northern parts of the Ryukyu Islands) and the Korean Peninsula (mainland and Jeju-do Island), and usually inhabits somewhat dry forests and areas along the seashores. The genus *Ainsliaea* DC. is endemic to East Asia, with 40–50 species occurring in this regions. In Korea, two species and one variety have been reported (Kim, 2007; Mitsui et al., 2008).

The molecular data describing cpDNA and nrITS suggest the genus has separated into two large populations and speciated. Specifically, the genus has divided into an eastern group (between SE China and Japan) and a western group (Yunnan province and its surrounding areas, including the Himalayas, the temperate region of Southeast Asia, and Sichuan province). *Ainsliaea apiculata* is closely related to *A. faurieana* Beauverd in Yakushima Island (Kyushu, Japan) and *A. oblonga* Koidz. in Rhukyu Island (Kagoshima, Japan) (Mitsui et al., 2008). The colonization of Ryukyu by *A. apiculata* was initially from the Asian mainland to the southern islands, followed by dispersal on the northern island via land bridges during the Quaternary glaciations. The speciation in the colonized habitats may have occurred through local adaptations and geographic isolation.

Written by Gyu Young Chung & Kyong Sook Chung

Ammopiptanthus mongolicus (Maxim. ex Kom.) S. H. Cheng

Fabaceae

- 沙冬青
- Монгол мөнххаргана
- Аммопиптантус монгольский

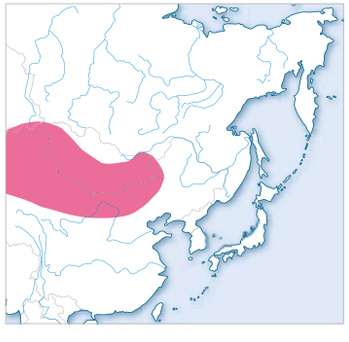
©Batlai Oyuntsetseg

Description

Shrubs evergreen, 2 m tall. Stems strongly branched. Bark yellowish-brown, young shoots grayish-pubescent. Stipules adnate to petiole, small, triangular. Leaves compound, ternate, rarely simple, coriaceous; leaflets rhombic-elliptic to broad-lanceolate, 2.0–3.8 cm long, 0.6–2.0 cm wide, densely silvery tomentose on both surfaces, margin entire. Inflorescences racemes, terminal, 8–10 flowered. Corolla yellow, 20 mm long. Fruits legume, complanate, linear-oblong, 5–8 cm long, 1.6–2.0 cm wide, apex acute, glabrous. Fl. and fr. May–Jul.

Distribution

Endemic to Central Aisa: Mongolia [Gobi-Altai (Baruun Tsokhio, Khurkh, Tsokhio mountains), eastern Gobi (Ulaan Del, Ulaan Titem mountains of Galbyn Gobi), Alashaa Gobi (Borzongiin Gobi, southern slope of Khurkh, Zuramtai Ikh-Argalant, Onchiin Khyar, Baga Argalant, Khalzan, Toonotyn Sair, Tsagaan ders)], Mainland China [Nei Menggu]



Ammopiptanthus mongolicus, evergreen xerophyte shrubs growing in the Central Asia desert known as a relict of the Tertiary Period (Wu, 1983). Because of high tolerance to temperature, salinity and water stress, it has survived for more than 70 million years from the Tertiary Period (Xu et al., 2002). *A. mongolicus* share high morphological similarity with *A. nanus* (M. Pop.) Cheng f. (Pan and Huang, 1993; Xu et al. 2002). Both species are narrowly distributed in deserts and suffer from low seed germination in the wild (Xu et al., 2002). This is a rare and endangered species of Fabaceae in the Central Asia desert (Xu et al., 2002). Based on estimation of the genetic differentiation, Xu et al. (2002) speculated that ancestral *Ammopiptanthus* was widely and continuously distributed from the eastern border of the Pamir Plateau to the Gobi Desert during the Tertiary period (Liu, 1995). However, they have been isolated from each other since formation of the geographic barrier in the early Pleistocene. Chen et al. (2009) also conducted an allozyme diversity study that verified a pre-existing population before habitat fragmentation. Writtend by Batlai Oyuntsetseg

©D. Suran

Amygdalus mongolica (Maxim.) Ricker

Rosaceae

- 蒙古扁桃
- Монгол бүйлс
- Монгольский миндаль

Description

Shrubs 25–80 cm tall. Stems very thorny, with divaricate thorny branches, which are spreading, highly branched. Branchlets reddish brown when young, grayish brown with age, pubescent, often spine-tipped. Leaves oval, broad-obovate or orbicular, 0.5–1.5 cm long, finely and indistinctly serrate-dentate, completely glabrous, coriaceous. Flowers pale pink, solitary, rarely several fascicled on short branchlets, sessile expanding before leaves. Petals pink, obovate, 5–7 mm. Stamens many, unequal in length. Pistils pubescent. Styles slender, as long as stamens, pubescent. Drupes subsessile, broadly ovoid-globose, 1.2–1.5 × 1.0–1.2 cm, pubescent, apex acute. Seeds pale brown, broadly compressed ovoid. Fl. May-Jun, fr. Aug-Sep.

Distribution

Mongolia [eastern Gobi, Gobi-Altai, Alashan Gobi phytogeographical regions], Mainland China [Gansu, Nei Menggu, Ningxia]

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Almonds (*Amygdalus* ssp.) fall into two subgenera and four sections. *A. mongolica* placed in the subgenus *Orientalis* species group in section *Amygdalus* (Browicz and Zohary, 1996). Most species of the genus *Amygdalus* are distributed in southwestern Asia and southwest Europe, but *A. mongolica* grows only in southern Mongolia and is geographically separated from all other members of the genus (Browicz, 1989; Browicz and Zohary, 1996). It is not clear whether the origin of wild almond domestication was the Levant region of the eastern Mediterranean or Central Asia (Browicz and Zohary, 1996; Ladizinsky, 1999). According to Jing et al. (2013), *A. mongolica* shows higher levels of genetic diversity and appears to be very closely related to the domestic cultivar (*Amygdalus communis* L.); therefore, it can be used as parent material for almond breeding.

Written by Indree Tuvshintogtokh

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Angelica ursina (Rupr.) Maxim.

Apiaceae

- 当归属
- エゾニュウ
- *Дудник медвежий*

© Vyacheslav Barkalov

Description

Herbs perennial, monocarpic, 2.0–2.5 (4.5 m); forming tall-herb meadows in oceanic regions of eastern Asia. Stems solitary, robust, bared, 7–8 cm in diam. near the bases. Leaves with wide sheaths, bi- or tri-pinnate dissected blades, 20–60 cm long, 20–40 cm wide; leaflets lanceolate, 5–20 cm long, 2–8 cm wide; petioles 70 cm long. Umbels numerous, with largest ones on top. Main umbels 20–40 cm in diam., with 50–100 radians. Flowers pure white. Fruits broad elliptic, ca. 7 mm long.

Distribution

Russian Far East [Kamchatka, Sakhalin, Kuril Islands], Japanese Archipelago [Hokkaido, N Honshu]

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This species is one of the most prominent representatives of tall-herb meadows, which are unique to Northeast Asia and distributed in areas with heavy snow accumulation in winter time that shortens the growing season. The plants are characterized by extremely rapid accumulation of biomass during the short growing period. *Angelica ursina*, together with other representatives of giant herbs (*Filipendula camtschatica*, *Senecio cannabifolius*, *Petasites amplus*), forms meadows within the oceanic sector of the boreal zone and shows increased presence with proximity toward the Pacific Ocean. The plant is especially common in the southern Kamchatka, Sakhalin and Kuril Islands. This vegetation type occurs on water-saturated sites throughout areas of high snow accumulation along the Pacific coast under conditions of boreal oceanic climate characterized by very low heat and high (over 1,500 mm) precipitation, most of which falls in winter, and very low insolation in summer due to fog and cloudiness (total hours < 1,000–1,500 per year). The adaptive complex of *Angelica ursina* and other representatives of the Northeast Asian tall herbs was likely formed during the Pleistocene in areas along the Pacific coast Bering land bridge. This history is characteristic of several tall herb species, including *Filipendula camtschatica*, *Senecio cannabifolius*, and *Petasites amplus*.

Written by Pavel V. Krestov

Aristolochia manshuriensis Kom.

Aristolochiaceae

- 木通马兜铃
- 등칡

Aristolochiaceae, one of the families in primitive group Piperales L., comprises about 600 species in seven genera. *Aristolochia* L. occurs in subtropical and tropical regions with about 500 species. Among several species in temperate regions, only two in *Aristolochia* subgenus *Isotrema*, *A. manshuriensis* Kom. and *A. contorta* Bunge, occur in Korea (Oh, 2007; Nakonechnaya et al., 2008). Using molecular data and penalized likelihood with fossil calibrations, González et al. (2014) demonstrated that *Aristolochia manshuriensis* is sister to North American herbaceous *A. tomentosa* Sims. and postulated that this intercontinental split is to be occurred during the late Miocene (7–5 million years ago). The ancestral area reconstruction suggests that the family was diverged from trans-Pacific ranges (either China and eastern North America, or Japan and eastern North America) during about 5 million years ago (González et al. 2014). The present disjunctive distribution of the *Aristolochia* subgenus *Isotrema* between North America and East Asia seems to be developed via a number of dispersal, vicariance and extinction events (González et al., 2014), but further research with broadened taxon and molecular marker sampling is needed to understand the distribution pattern of the species.

Written by Gyu Young Chung & Kyong Sook Chung

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Description

Vines broad-leaved, deciduous, 10 m tall. Stems leaning, grayish green. Leaves alternate, cordate, 10–26 cm long, entire, glabrous or pubescent; petioles 7 cm long, glabrous. Flowers zygomorphic, yellowish green, axillary, solitary; calyx tube strongly curved, 10 cm long, limb 3-lobed; pedicles 2–3 cm. Ovary pale, 5 mm. Capsules long, oval, ellipsoid, 11 cm long, 3 cm in diam. Fl. May, fr. Sep–Oct.

Distribution

Russian Far East [Ussuri], Mainland China [Gansu, Heilongjiang, Hubei, Jilin, Liaoning, Shaanxi, Shanxi, Sichuan] Korean Peninsula [Pyeonganbuk-do, Gyeonggi-do, Gangwan-do, Chungcheongbuk-do, Gyeongsangbuk-do, Gyeongsangnam-do, Jeollabuk-do]

Astragalus mongholicus Bunge

Fabaceae

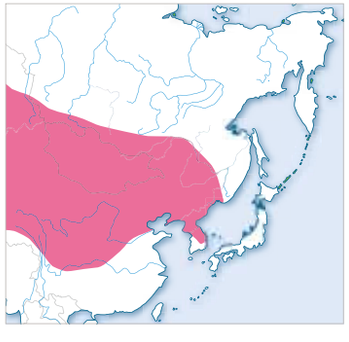
- 蒙古黄耆
- 황기
- Монгол хунчир
- Астрагал монгольский

Description

Herbs perennial, 25–60 cm tall. Stems erect, glabrous or covered with white hairs. Leaves 6–15 cm, nearly sessile; leaflets in 8–18 pairs, narrowly ovate to elliptic, glabrous above, hairy beneath, apex obtuse. Racemes loosely many flowered, 4–5 long, elongated at fruiting. Sepals campanulate-tubular, 5–9 mm, glabrous or sparsely covered with short ascending black hairs. Petals yellow, rarely lilac. Legumes almost half circular to elliptic, sharply keeled ventrally, narrowly rounded dorsally, apex shortly acuminate.

Distribution

Eastern Siberia, Russian Far East, Mongolia [Khovsgol, Khentei, Khangai, Mongolian Dauria, Foothills of Great Khingan, Mongolian Altai, Middle Khalkha, eastern Mongolia, Depression of Great Lakes, Valley of Lakes, Gobi-Altai phytogeographical regions], Mainland China, Korean Peninsula [Hamgyeongbuk-do, Hamgyeongnam-do, Gangwon-do]



In Mongolian traditional medicine, *Astragalus mongholicus* is used to treat fatigue, injury and wound. The root has been used for many centuries in traditional Chinese medicine and is currently cultivated in northern China. Written by Dashzeveg Nyambayar

Berchemiella wilsonii (C. K. Schneid.) Nakai

Rhamnaceae

小勾儿茶

©Hongwen Huang

Description

Shrubs deciduous, 3–6 m tall. Branchlets glabrous, brown. Stipules broadly triangular. Leaves elliptic, green above and gray-white beneath, 7–10 cm long, 3–5 cm wide, papery, adaxially glabrous, abasially densely pubescent or with barbate vein axils; petioles 4–5 mm long, glabrous or pilose. Inflorescences glabrous, greenish, 3.5 cm long. Fruits red when young, nearly black at maturity, cylindrical to slightly obovoid. Fl. Jul, fr. Aug–Sept.

Distribution

Endemic to Mainland China [Anhui, Hubei, Zhejiang]

Schneider (1914) described *Chaydaia wilsonii* based on a collection, Wilson 3388, from Xingshan County, Hubei, China. Nakai (1923) transferred the species to *Berchemiella* Nakai, making the combination *Berchemiella wilsonii* (C. K. Schneid.) Nakai. Over the past 90 years, this species was not found again in the wild, despite great efforts to do so. During a botanical expedition conducted by the taxonomists of Wuhan Botanical Garden to the Houhe National Nature Reserve, Wufeng County, Hubei, about 130 km away from Xingshan County, two individuals of *Berchemiella wilsonii* were unexpectedly found.

Written by Hongwen Huang

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Betula ermanii Cham.

Betulaceae

- 岳桦
- ダケカンバ
- 사스래나무
- Береза Эрмана

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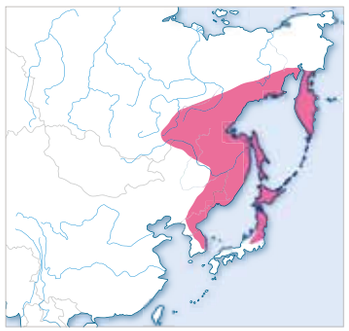
Description

Trees deciduous, 25 m tall. Stems crocked, with wide crown, 1 m in diam. Bark white-yellowish, smooth on young stems, white-grayish on old stems, peeling with large plates. Leaves ovate, apex acute, unevenly toothed, 4–12 cm long, 3–8 cm wide, with less than 12 nerve; petioles 5–30 mm long. Male catkins pendulous, 8 cm long. Female catkins erect, cylindrical, 2–4 cm long, 2 cm in diam. Nuts broadly obovate, puberulent above, 2–3 mm long. Wings narrower than nut. Fl. Jun-Jul, fr. Sep.

Distribution

Southern Siberia, Russian Far East, Mainland China, Korean Peninsula [Yanggang-do, Hamgyeongbuk-do, Hamgyeongnam-do, Gangwon-do], Japanese Archipelago [Hokkaido, Honshu]



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Forests of Ermann's stone birch characterize the maritime and suboceanic regions of boreal Northeast Asia. Stone birch forms well developed vegetation belts in mountains influenced by oceanic air masses throughout its entire range. *Betula ermanii* does not occur in wetlands or on permafrost, but its distribution does depend on, among other factors, snow depth and timing of snowmelt (length of snow-free period). *Betula ermanii* has very wide, low crowns with side branches developed at the same angle as the axial stem. When the terminal bud of young trees reaches outside the snow cover, the axial shoot is damaged, perhaps killed by snow abrasion, and is replaced by the shoot from the lateral bud. This is the main reason for the crooked stems in many stands. The late snowmelt and short snow-free period limits potential conifer competitors. *Betula ermanii* dominates the stands, forming a well-developed canopy with a cover of 70–80%. *Alnus fruticosa*, *Pinus pumila* and *Sorbus sambucifolia* may form a tall-shrub layer in stone birch stands. The herb layer varies widely depending on local site ecology and includes several strata. Most common in the tallest stratum, reaching 2 m, is *Angelica ursina* (in the south and west), *Heracleum lanatum*, *Senecio cannabifolius*, *Cacalia hastata*, *Cirsium kamtschaticum*, *Veratrum alpestre*, *Aconitum maximum*, *Urtica platyphylla* and *Filipendula camtschatica*. This group is usually referred to as 'Kamchatkan tall herbs'. Because the whole *Betula ermanii* forest area is in a humid climate, and thus has well-developed herb layers, a moss-lichen layer on the ground is not abundant. However, the mosses and lichens are very diverse on the birch stems. Similar adaptation complexes are characteristic of several birch species distributed in the snowy areas of Scandinavia.

Written by Pavel V. Krestov

Brachanthemum mongolorum Grubov

Asteraceae

- 蒙古短舌菊
- Монголчуудын тост

Description

Subshrubs dwarf, 5–20 cm tall. Stems with lignescent prostrate strongly branched thin stems and solitary calathidia on thin annual erect shoot. Leaves twice trisected into linear lobes, palmate-pinnate, 3–5 divided, sessile or subsessile, obliquely elliptic or suborbicular, ca. 0.6 × 0.5 cm, grayish green or green, appressed pubescent, glabrescent. Synflorescences an irregular flat-topped cyme. Capitula 3 or 4. Involucres obconical or campanulate, 4–6 mm in diam. Phyllaries in 4 rows, outer ones ovate, ca. 2.5 mm long, scarious margin brownish, middle ones elliptic, ca. 6 mm long, inner ones oblanceolate, ca. 5 mm long. Ray florets ca. 8, yellow, apex minutely 2-denticulate. Achenes ca. 2.8 mm long. Fl. and fr. Aug.

Distribution

Endemic to Mongolia [eastern Mongolia phytogeographical region (5 km northeast of Matad sum of Dornod province, Tsog-Undur Mountain, 16 km northeast of Ar Jargalant monastery)]

The essential oil of the leaves of *Brachanthemum mongolorum* was investigated by GC and GC/MS. The clear essential oil of *B. gobicum* was dominated by 1,8-cineole (42.6%) and camphor (29.1%), with moderate amounts of camphene (6.1%), α-pinene (2.5%), p-cymene (1.8%), terpinen-4-ol (1.8%) and cis-sabinene hydrate (1.3%). The oil of *B. mongolicum* had an abundance of camphor (39.5%) and 1,8-cineole (20.2%), with moderate amounts of camphene (11.5%), borneol (9.5%), bornyl acetate (4.1%), *cis*-thujone (1.9%), α-pinene (1.3%) and p-cymene (1.1%). The major constituents of the blue oil of *B. mongolorum* were chamazulene (18.3%) and 1,8-cineole (14.6%), followed by (b)-caryophyllene (7.2%), germacrene D (5.4%), dehydro-1,8-cineole (4.5%), p-cymene (3.8%), (E)-β-ocimene (3.6%), caryophyllene oxide (2.7%) and limonene (2.3%).

Written by V. Gundegmaa

Brasenia schreberi J. F. Gmel.

Cabombaceae

- 莼菜
- 순채
- Бразения Шребера

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Description

Herbs perennial, aquatic, whole plant under water, covered with thick mucilage. Rhizomes creeping horizontally. Leaves floating, elliptic to broadly elliptic, peltate, entire, bright green, 3–6 cm long, 4–10 cm wide. Flowers floating, dull purple, single. Sepals 3, petaloid. Petals 3, linear-oblong, ca. 2 cm in diam. Fruits achene-like. Seeds 1–2 per fruit, ovoid.

Distribution

Widely distributed globally, but very sporadic and rare in northeast Asia: Asia, North America, Australia, West Africa

Despite *Brasenia* being widely cultivated as a vegetable in China and other Asian countries, it remains rare in natural aquatic ecosystems of northern Asia. *Brasenia* belong to the ancient floristic complex that was formed in the Tertiary and possibly survived Pleistocene climatic catastrophes in numerous aquatic refugia across northern Asia. This species is considered rare in Russia and its natural populations need to be strictly protected. Its history is similar to that of other aquatic species, such as *Nelumbo nucifera* and *Nuphar japonica*.

Written by Pavel V. Krestov

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Calligonum gobicum (Bunge ex Meisn.) Losinsk.

Polygonaceae

- 戈壁沙拐枣
- Говийн зорлог, Азар, Торлог, Улаан түлээ

Description

Shrubs 80–100 cm tall. Old branches long, straight. Herbaceous branchlets of current year gray-green. Joints 1.5–3.0 cm. Leaves linear, 1.5 mm, ocreae united to leaf; pedicels ca. 2.3 mm long, slender, jointed below middle. Flowers red. Tepals reflexed in fruit, broadly elliptic. Fruits broadly ovoid, 1.1–1.8 × 1.0–1.5 cm. Achenes oblong, not or slightly coiled. Ribs obtuse, somewhat broad, deeply canaliculate, bristles in 2 rows at margin of ribs, sparse, approximately as long as or slightly longer than width of achenes, thick, breakable, slightly enlarged, 2-branched from the middle or above. Fl. May-Jul, fr. Jun-Aug.

Distribution

Mongolia [southern and southwestern regions: Dzungarian, Transaltai, Alashan Gobi phytogeographical regions], Mainland China [Xinjiang, Gansu, Alashan Gobi region]

These plants occur across much of Mongolia, but are most common in steppe zones, where they are often dominant in grazing ecosystem. To develop the conservation of *Calligonum* species germplasm, some detailed investigations of the distribution, resources, extinction status and biological and ecological characteristics of *Calligonum* are proposed.

Written by Batlai Oyuntsetseg

Camellia impressinervis H. T. Chang & S. Y. Liang

Theaceae

凹脉金花茶

©Jingping Liao

Description

Shrubs or trees 1.5–5.0 m tall. Leaves elliptic to oblong-elliptic, 12–18 cm long, 3.0–8.5 cm wide, blade leathery, margin abaxially elevated and adaxially, veins abaxially elevated and adaxially impressed. Flowers axillary, solitary, ca. 5 cm in diam. Petals yellow. Ovary ovoid, ca. 2 mm in diam., glabrous, 3-loculed. Styles 3, distinct. Capsules oblate, 3 cm in 1.0–1.5 mm thick. Fl. Jan–Mar, fr. Oct.

Distribution

Endemic to Mainland China [Guangxi (Longzhou)]

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Golden *Camellia* is first mentioned as *Camellia petelotii* (Merrill) Sealy from Guangxi in southern China and northern Vietnam. This rare species as known as “Plant Panda” and “Tea tribe Queen”, with unique golden yellow petals is well known worldwide. However, the galaxy of yellow camellias that remains largely unknown to most *Camellia* collectors and western gardeners. Sect. *Chrysantha* Chang was established in 1979 (Chang, 1979), enclosed Ser. *Flavae* and Ser. *Chrysantha* Chang belonging to genus *Camellia* (Theaceae). Ser. *Chrysantha* Chang comprised 16 species, most of which were distributed in southern Guangxi of China and northern Vietnam. Sect. *Chrysantha* Chang was revised to *Camellia* sect. *Archecamellia* Sealy, which comprises 18 species (Min and Bartholomew, 2007). *Camellia impressinervis* is an endemic species in limestone areas of Guangxi, China, belonging to *Camellia* sect. *Archecamellia* Sealy is listed as a second rare and endangered plant of China. Its type specimen was collected in Longzhou County, western Guangxi (Liang, 1970). It is similar to *Camellia nitidissima* Chi, but differs from *C. nitidissima* in that it has twigs with short hairs and elliptic leaf blades. Specifically, *C. impressinervis*, has twigs with short hairs, elliptic leaves 13–22 cm long that are pubescent, 14 to 10 lateral veins, 12 petals and pericarps 1–1.5 mm thick. *C. impressinervis* primarily grows in evergreen broad-leaved forests on calcareous hills at 100–500 m. It is a very good ornamental plant, and its seeds can be used for oil.

Written by Hongwen Huang

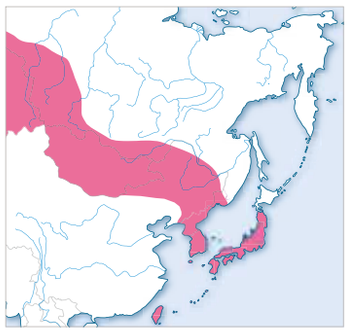
Cardamine parviflora L.

Brassicaceae

- 小花碎米荠
- 좀냉이
- Бяцханцэцэгт зууч
- Сердечник мелкоцветковый

Distribution

Russian Far East, Mongolia [Khentei, Khangai Mountain phytogeographical regions], Mainland China, Korean Peninsula, Taiwan Islands, Central Asia, North America



Description

Herbs annual, 7–40 cm tall, Stems erect, slender, glabrous or pilose, one to several from base, often branched above, somewhat flexuous. Basal leaves rosulate or not, often withered by anthesis, 1.5-5.0 cm long, pinnatisect; petioles 0.5-1.5 cm long; lateral lobes 3–5 on each side of the midvein, oblong, obovate, or suborbicular, sessile or petiolulate, subequaling or smaller than terminal lobe, entire or 3–or 5–toothed or -lobed. Cauline leaves pinnatisect or pectinate; lateral lobes 4–7 on each side of midvein, filiform, linear, or narrowly oblong, 16 × 0.3–3.0 mm, sessile, entire or rarely 1–3 toothed; terminal lobe similar to lateral ones or slightly larger. Fruiting pedicels divaricate or ascending, 4–10 mm, slender. Sepals oblong, 1–2 × 0.3–0.5 mm, membranous at margin and apex. Petals white, oblanceolate, 1.5–3.0 × 0.4–1.0 mm. Stamens 6; filaments 1.4–2.5 mm; anthers ovate, 0.2–0.4 mm. Ovules 20–50 per ovary. Fruits linear, 1–2 cm × 0.6–0.9 mm. Valves glabrous, torulose. Styles 0.3–1.0 mm. Seeds pale brown, oblong-ovate, 0.6–0.9 × 0.4–0.6 mm, narrowly margined or not. Fl. May-Jun, fr. Jun-Jul.

The genus *Cardamine* comprising ca. 200 taxa is the largest genus in Brassicaceae (Lihová, 2006). It is well known that *C. parviflora* is distributed in Eurasia and northern Africa (Almeida, 1973). Recently, North American populations have been considered *C. parviflora* var. *arenicola* (Britton) O. E. Schulz (Rollins, 1993 re-cited in Lihová, 2006). These two species grow in open moist habitats, and phylogenetic studies have indicated that they might be the origin of several geographically disjunct polyploids (Lihová, 2006).

Written by Batlai Oyuntsetseg

Caryopteris mongholica Bunge

Lamiaceae

- 蒙古荚
- Монгол Догар, Ямаан-эвэр, Агаруу
- Орехокрыльник монгольский

©Batlai Oyntsetseg

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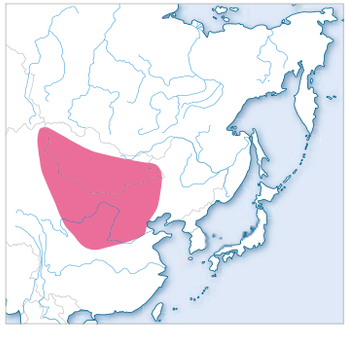
Description

Subshrubs 30–150 cm tall, usually branched from base. Branchlets purple-brown, pubescent when young, glabrescent. Leaves opposite, linear-lanceolate, densely pubescent gray-green leaves with entire margin (rarely with spaced teeth). Inflorescences cymes, terminal or axillary. Corolla blue-purple, 1.0–1.5 cm; lower lobes strongly fringed. Fruits nutlets with winged edges, subglobose, glabrous. Fl. and fr. Aug–Oct.

Distribution

Mongolia [Hovsgol, Khentei, Khangai, Mongol Daguur, Mongolian Altai, Middle Khalkha, Valley of Lakes, Eastern Gobi, Gobi-Altai, Transaltai Gobi, Alashan Gobi phytogeographical regions], Mainland China [Gansu, Hebei, Nei Menggu, Shaanxi, Shanxi]



Although several *Caryopteris* species are grown in botanical gardens, as ornamental plants, the species have largely been superseded in gardens by the hybrid *Caryopteris* × *clandonensis* (*C. incana* × *C. mongholica*). The accidental cross that produced it occurred in the garden of Arthur Simmonds at Clandon, near Guildford, Surrey. In 1930, wishing to propagate *C. mongholica*, Simmonds gathered seeds from a plant that was growing near *C. mastacanthus*. When the seedlings eventually flowered in their second year, hybrids appeared. However, the final selection was a self-sown volunteer that appeared under *C. mastacanthus* and eventually smothered it. The plant began winning Royal Horticultural Society medals in 1933. This small, deciduous, aromatic shrub has grey-green leaves and produces masses of blue flowers in late summer. There are several cultivars with flowers in shades of blue or white, including 'Blue Mist', 'Heavenly Blue', 'Longwood Blue', 'Dark Knight', 'Summer Sorbet' and 'Pershore'. The cultivars 'Arthur Simmonds', 'First Choice' and 'Worcester Gold' have gained the Royal Horticultural Society's Garden Merit award. Leaves and herbaceous stems have a terpene aroma like eucalyptus, especially when lightly bruised.

Written by Magsar Urgamal

Castanopsis carlesii (Hemsl.) Hayata

Fagaceae

- 米槠
- 長尾栲, 長尾柯, 卡氏櫧, 長尾尖葉櫧

© Chien-Fan Chen

Description

Trees broad-leaved, evergreen, 20 m tall. Leaves ovate-oblong, 4.5–10.0 cm long, 1.8–3.8 cm wide, entire or dentate-serrate, brown or silvery white beneath. Male inflorescences 5–7 cm long. Female inflorescences 7.0–8.5 cm long, involucres containing one flower, ovary with three styles, stigma pointed. Fruits conical, 1.3–1.8 cm long, cupule splitting when ripe, with tuberculate spines and tomentose above. Seeds nuts, one in each cupule, ovoid. Fl. Mar–May, Fr. Oct–Dec.

Distribution

Mainland China [southeastern regions], Taiwan Islands [commonly found at elevations between 150–2,500 m throughout the island]

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Castanopsis carlesii is closely related to *C. cuspidate* (Thunb. ex Murray) Schottky, which is distributed in Japan and Korea. The former was also regarded as *C. cuspidate* var. *carlesii* (Hemsl.) Yamazaki (Liao, 1996).

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In Taiwan, *Castanopsis carlesii* occupies a wide range and diverse habitats, resulting in its various morphological and genetic divergence. Cheng et al. (2005) applied molecular biotechnology to reveal the phylogeography of *C. carlesii* and found that the central Mountain Ridge of Taiwan represents an insurmountable barrier to the east-west gene flow of *C. carlesii*. Accordingly, population immigration and gene flow can only connect on each side. The results also suggest that two potential refugia existed during the last glaciations, the northern part of Hsuehshan Range in northwest Taiwan and southeastern Taiwan.

Castanopsis carlesii is the host of an endangered species, *Mitrastemon kanehirai* Yamam., which is a root holoparasite plant. To date, the species has only been found on the root of *C. carlesii* during September to December.

Written by Chien-Fan Chen

Castanopsis sieboldii (Makino) Hatus.

Fagaceae

- スダジイ
- 구실잣밤나무

© Katsuhiro Nakao

Description

Trees evergreen, 15–25 m tall, 80–100 cm in diam. Bark fissured. Leaves alternate, coriaceous, ovoid-oblong, 5–15 cm long, 1.5–2.5 cm wide, entire or toothed. Monoecious. Male flowers erect or spreading, slender aments; sepals 5–6; stamens ca. 15. Femle flowers usually subtending the staminate aments, pollinated by insects. Nuts ovoid-oblong, 1–2 cm long.

Distribution

Korean Peninsula [Jeollanam-do, Jeju-do], Japanese Archipelago [Honshu, Shikoku, Kyushu]

© Dai Koide

Castanopsis sieboldii, *C. cuspidata* and *C. sieboldii* var. *lutchuens* occur in Japan, and are identified by the size of the nuts and the structure of the epidermis. *Castanopsis carlesii* occurring in Taiwan Islands and mainland China has morphological characteristics similar to *C. sieboldii* and *C. cuspidata*.

The genus *Castanopsis*, belonging to Fagaceae, are evergreen trees that include more than thirty species distributed in East Asia, Southeast Asia and the Himalayan region. *C. sieboldii* used to be widespread in the subtropical to warm temperate zone, forming the northern range limit of *Castanopsis* species at a latitude of 38 degrees north in Japan. Climatic factors such as coldest temperature in winter have played important roles in determining the northern range limits of the species. A species distribution model study revealed that the current northern range limits of the species in some areas of Japan and Korea are not entirely explained by climatic factors, suggesting that the distributions of the species are not in equilibrium with the current climate conditions (Nakao et al., 2014). Thus, historical range shifts may also have restricted the northern range limits of the species. People used seeds for food, timber for construction and bark to generate dyes for traditional clothing in Japan.

Written by Katsuhiro Nakao

Cathaya argyrophylla Chun & Kuang

Pinaceae

银杉

© Hongwen Huang

Description

Trees coniferous, evergreen, 20 m tall. Bark dark gray, irregularly flaking. Branchlets yellow-brown, initially densely gray-yellow pubescent, aging dark yellow and glabrous. Leaf cushions topped with pale, orbicular or subsquare leaf scars. Leaves dark green, adaxially 4–6 cm long, 2.5–3.0 mm wide. Carpellate strobili green, dark brown when mature, ovoid or ellipsoid. Seed scales 13–16. Seeds dark green mottled with light green, slightly appressed, obliquely ovoid. Wings yellow-brown, obliquely ovate or elliptic-ovate.

Distribution

Endemic to Mainland China [NE Guangxi (Jinxiu, Longsheng), N Guizhou (Daozhen), S Hunan, SE Sichuan (Nanchuan, Wulong)]

The sole species in *Cathaya* Chun & Kuang, which belongs to subfamily Laricoideae in the Pinaceae. It is most closely related to *Pseudotsuga* and *Larix*. The original description was by Chun and Kuang in 1958. However, the name was not validly published because two species were described simultaneously and the type species was not indicated (Wu and Raven 1999). Genetics work by Ge et al. (1998) and Wang and Ge (2006) indicates that, compared to other conifers, *Cathaya* has rather low genetic diversity, but there are significant differences between populations that support the existence of at least four refugia where the species occurred during the last Pleistocene glaciations and indicate that the populations have remained isolated since that time.

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Cathaya argyrophylla is a prime example of a relict conifer that had a very much wider distribution in the geologic past. In the Tertiary, *Cathaya* occurred in Europe, Russia, and Canada, and fossils of extinct species of *Cathaya* are abundant in European brown coal deposits dating from between 10–30 million years ago. Its taxonomic position has been the subject of some debate in the past, but more recent phylogenetic studies in the Pinaceae have confirmed its status as a genus, probably related to *Pseudotsuga* in a 'pinoid' clade.

Cathaya is confined to a limited area in southern China, in the provinces of Guangxi, Guizhou, Hunan and southeast Sichuan. It is found on steep, narrow mountain slopes at 950–1,800 m above sea level, on limestone soils. A larger population was reduced by over-cutting before its scientific discovery and protection in 1950. This species has a small global population, with less than 1,000 mature individuals. After its discovery in the 1950s, this monotypic genus was considered to be an extremely rare conifer for many years. Even herbarium specimens were few, and virtually none reached botanic gardens and institutional herbaria outside China until very recently. Its extent of occurrence (EOO) is now known to encompass four provinces in south-central China, and herbarium collections are known to exist in at least 10 localities in China. It is usually growing on inaccessible slopes and ridges. The populations are well protected, but there is concern that they will be replaced by faster growing broad-leaved species if regeneration continues to be poor. The species is now in cultivation in China and slowly becoming available through some botanic gardens in the west.

Written by Hongwen Huang

Cerasus speciosa (Koidz.) H. Ohba

Rosaceae

- 大島櫻桃
- オオシマザクラ
- 오시마벚나무

Genus *Cerasus* often used to be included as a part of *Prunus*. The genus occurs in the temperate zone of the Northern hemisphere and its center is East Asia. Cherry blossom (Sakura in Japanese) is a symbolic flower of Japan. There are nine species and three varieties of wild cherries in Japan. Horticulture and breeding of cherry blossom has a long history of more than 1,200 and 300 years, respectively, and more than 250 cultivars have been developed to date. A recent genetic study revealed that *C. speciosa* would be a genome donor to more than 70% of cultivars. The *C. lannesiana* lineage is mainly composed of double flowered cultivars with hybrid origins from *C. speciosa* and other species. The most popular cultivar, 'Somei-yoshino', is a hybrid between *C. spachiana* and *C. speciosa*.

Leaves that have been preserved with salt are used as wrappers for Japanese traditional cakes because of their size and fragrance. Salt-pickled flowers are also used for cherry blossom tea.

Written by Takayuki Kawahara

Description

Trees deciduous, 20 m tall. Bark black purplish or grayish purple; lenticels distinct. Leaves alternate, petiolate, green when young (those of the close relative, *C. jamazakura*, are reddish), fragrant, obovate 9–12 cm long, 6.4–8.0 cm wide; petioles 1.5–3.0 cm long, glabrous. Inflorescences corymbose, 3–4 flowered; pedicles glabrous, 2–4 cm long, rather large, 4.0–5.4 cm wide. Petals pale pink to white. Fruits small black cherry, glabrous. Fl. Mar-Apr, fr. Jun-Jul.

Distribution

Endemic to Japanese Archipelago [warm coastal regions: southern Kanto District, Izu Peninsula, Izu Islands]

Cercidiphyllum japonicum Siebold & Zucc. ex J. J. Hoffm. & J. H. Schult. bis

Cercidiphyllaceae

- 连香树
- カツラ
- 계수나무

Description

Trees deciduous, large, multi-trunk, 30 m tall, 2 m in diam.; single tree increases trunks by sucker from the base. Leaves opposite, pairs on long shoots, rounded, heart-shaped base, turning pink, orange-red and yellow in autumn, sometimes emitting a caramel scent. Dioecious. Flowers inconspicuous among opening leaves. Follicles cylindrical, clusters of two to four, 1.0–1.8 cm long. Seeds flat, light, winged. Fl. Apr–May.

Distribution

Warm and cool temperate deciduous forests, listed as endangered in China but common in Japan: Mainland China, Japanese Archipelago

Cercidiphyllum, the only member of Cercidiphyllaceae, contains two extant species, *C. japonicum* and *C. magnificum*. This genus is a relict of the palaeotropical Northern hemisphere flora of the Tertiary period. This type of flora includes monotypic or low-diversity taxa such as *Davidia*, *Euptelea*, *Ginkgo*, *Metasequoia*, and *Tetracentron*, as well as *Cercidiphyllum*. The long-term persistence of these taxa is explained by the absence of extensive glaciation and a smaller magnitude of Quaternary environmental change when compared with Europe and North America. A recent study (Qi et al., 2012) revealed that during glacial periods, the warm-temperate *C. japonicum* experienced massive habitat losses in some areas (north-central China/north Japan), but increases in others (southwest/east China, East China Sea land bridge, south Japan). In China, the Sichuan Basin and/or the middle-Yangtze were source areas of postglacial northward recolonization. In Japan, this may have been facilitated through introgressive hybridization with the cool-temperate *C. magnificum*. Written by Nobuyuki Tanaka

Chesneya mongolica Maxim.

Fabaceae

蒙古旱雀豆

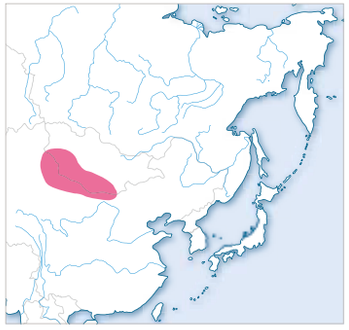
Монгол буурцгана

Description

Herbs cushion like, 5–10 cm tall. Stems shortened. Leaves 2–4 cm long, 7- or 9-foliolate; stipules ovate, 4 mm long, submembranous, adnate to petiole for ca. 1/2 its length, persistent, with dense white long appressed hairs; leaflet elliptic or obovate, 5–6 × 3 mm, both surfaces with white silky short appressed hairs, base cuneate, apex acute or spinelike. Flowers solitary; pedicels 4–5 mm long; bracts linear, 8 mm long. Bracteoles similar to bracts. Calyx tubular, 15 mm long, with dense long hairs and dark brown glands, gibbous at base, inflated on one side. Corolla purple, standard 25 mm long; lamina oblong, dense short hairs abaxially; wings 20 mm long; keels shorter than wings. Ovary sessile, dense hairs. Legumes unknown. Fl. Jun, fr. Jul.

Distribution

Mongolia [Great Lakes Depression (Khyargas, Sharga lake valleys), Valley of Lakes (Tui River, Ongi River Delta: Orog, Ulaan lake valleys), Eastern Gobi (Bayanzag, Ulaan lake depression), Gobi-Altai], Mainland China



The genus *Chesneya* was included in the subtribe Astragalinae in Leguminosae along with the genera *Halimodendron*, *Caragana*, *Calophaca*, *Spongiocarpella*, *Chesneya*, *Astragalus*, *Astracantha*, *Oxytropis*, *Neodielsia*, and *Gueldenstaedtia* (Polhill, 1994; Zhu, 2005). About 21 *Chesneya* species are distributed in Central and Southwestern Asia and the Mediterranean.

C. mongolica is distributed in Central Asia i.e. in the arid regions of Mongolia and Inner Mongolia, China. This species grows mainly in the alkaline sands, sandy debris accumulated in the low mountains and hills, sandy pebble bottoms of embankment in the semi-desert and desert ecosystems. The main threats of this species are droughts, aridization, sand movement and overgrazing.

Written by Batlai Oyuntsetseg & Badamdorj Bayartogtokh

Cryptomeria japonica (Thunb. ex. L. f.) D. Don

Cupressaceae

- 日本柳杉
- スギ
- 삼나무

Description

Trees coniferous, evergreen, 40 m tall, 2 m in diam. Stems erect. Bark reddish brown, fibrous, peeling off. Leaves dark green, closely and spirally arranged, incurved, 3–12 mm long. Monoecious. Staminate strobili crowded at the ends of branchlets, broad oblong, 5–7 mm long, 2–3 mm wide. Carpellate strobili solitary at the ends of branchlets, globular, 5 mm long and wide. Cones ripe within a year. Seeds narrowly oblong with narrow wings in both sides. Fl. May, fr. Sep.

Distribution

This species prefers deep soil and mesic conditions in the warm to middle temperate zone, widely planted in Japan and partly in China: Japanese Archipelago [excluding Hokkaido, Okinawa], Mainland China [Fujian (Nanping), Jiangxi (Mt. Lu-shan), Zhejiang (Mt. Tianmu-shan), Sichuan, Yunnan]

Two varieties are recognized, var. *japonica* in Japan and var. *sinensis* (syn. *C. fortunei*) in China. There are two ecotypes in Japan. The branches of Japan Sea/East Sea side populations known as Ura-sugi, which means back side Japanese cedar, are tolerant of heavy snow, while those on the Pacific side known as Omote-sugi, meaning front side Japanese cedar, are not tolerant of heavy snow. Some Ura-sugi can produce clones by generating roots from the branches suppressed by heavy snow. In the maximum of the last glacial period (20,000 years BP), Japanese cedar escaped in some isolated refugia such as Oki Island, the Wakasa Bay area, Yakshima Island, and Izu Peninsula. According to fossil pollen records and genetic analyses, the distribution has spread north since 10,000 years BP. Japanese cedar is a dominant timber tree, occupying 44% of plantations in Japan. Its cultivation was actively accelerated from the 1950s to the early 1960s. Despite its economic and environmental values, mature plantations are now causing a social serious problem of pollen syndrome.

Written by Takayuki Kawahara

Cyathea lepifera (J. Sm. ex Hook.) Copel.

Cyatheaceae

- 笔筒树
- 筆筒樹

Description

Tree ferns, 6 m tall, ca. 15 cm in diam. Stems erect. Stipes 5 cm thick, large prominent scars around trunks, the lower part of the trunk usually covered with interlacing roots. Fronds to 2 m or longer, arranged in a terminal crown, tripinnatifid, veins free. Stipes rachis and rachillae tuberculate; scales of coniform type, linear-lanceolate, buff, margins bearing setae. Sori round, exindusiate; 64 spores per sporangium. Spores trilete.

Distribution

Mainland China [southern regions], Japanese Archipelago [Okinawa Island], Taiwan Islands, Philippine Archipelago

Cyathea lepifera is a subtropical-tropical and heliophilous tree fern, dominant in humid and disturbed sites such as roadsides, planting areas and landslides in low montane areas (< 1,200 m above sea level). *Cyathea lepifera* is regarded as an economic species by local residents. Living plants are used for ornamental purposes and its roots are used as a culture medium for orchids. Despite being listed in the Red Book of IUCN, it is common in Taiwan and Philippines. A novel disease "*Cyathea lepifera* wilt" induced by the pathogen "*Ophiodiaporthe cyatheae*" was first discovered in northern Taiwan in 2005, and has since spread throughout Taiwan (Fu et al., 2013). According to a 2011–2012 field investigation of *Cyathea lepifera* in Taiwan, ca. 36% of plants have been infected and died (Huang et al., 2014). To save this giant tree fern, spore banks for *ex situ* conservation in Taiwan have been established. A mature plant can annually produce 3–6 × 10^{10} spores, which have the potential for use in culture of sound sporelings. A useful method to culture spores was reported by Huang et al. (2000).

Written by Yao-Moan Huang

Cycas debaoensis Y. C. Zhong & C. J. Chen

Cycadaceae

德保苏铁

©Hongwen Huang

Description

Trunks almost subterranean, 40–60 cm tall, 25–40 cm in diam. above ground. Leaves 3-pinnate, ovate in outline, ± openly V-shaped in cross section at 110–150° between leaflets, 1.3–2.7 m long, 0.5–1.5 m wide; petioles spiny except at base. Staminate strobili 13–25 cm long, 4–9 cm in diam., microsporophylls narrowly cuneate. Megasporophylls deeply divided into 39–51 filiform lobes. Seeds 3 or 4, subglobose, slightly compressed, 3.0–3.5 cm long, 2.5–3.0 cm wide. Fl. Mar–Apr, fr. Nov.

Distribution

Endemic to Mainland China [Xian (Debao), NW Guangxi]

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Cycas debaoensis is a narrowly distributed endemic cycad that was first discovered and documented in 1997. Soon after its discovery, overharvesting severely reduced the natural populations, bringing the species to the brink of extinction (Ma et al., 2003). According to IUCN Version 3.1, its status is critically endangered (B2ab (i, ii, iii, iv, v)). *C. debaoensis* is now listed as a first grade species subject to national protection in China. *C. debaoensis* has an extremely narrow distribution and niche habitat. *C. debaoensis* usually occurs in small isolated populations in Karst limestone mountain slopes (Chen, 1997). The main threat to these species is illegal harvest for ornamentals. The original distribution range has been designated for protection and the prohibition of illegal harvesting is enforced by the local community. *Ex situ* conservation has also been implemented in Shenzhen Fairy Lake Botanical Garden. A state program for restoration was initiated in 2007. The first group of 500 garden-propagated plants was reintroduced into native habitats in Huangliangshan National Nature Reserve in 2008, and the results have been promising, providing evidence that *C. debaoensis* should recover when illegal harvesting is stopped and transplanting is aided.

Written by Hongwen Huang

Cypripedium guttatum Sw.

Orchidaceae

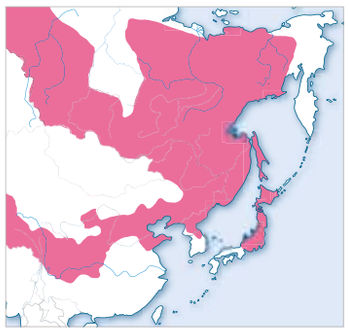
- 紫点杓兰,斑花杓兰
- チョウセンキバナノアツモリソウ
- 털복주머니란
- Башмачек пятнистый

Description

Herbs perennial, 15–25 cm tall, puberulent. Rhizomes slender, creeping. Stems erect. Leaves subopposite or occasionally alternate, at or above the middle of the plant; leaf blade often turning black or blackish when dried, elliptic, ovate, or ovate-lanceolate, 5–12 × 2.5–4.5 cm. Flowers white with purplish red or brownish red markings. Petals often subspatulate or pandurate, 1.3–1.8 × 0.5–0.7 cm; lips deeply pouched, pitcher-shaped, about 1.5 × 1.5 cm. Capsules pendulous, nearly narrowly ellipsoid, about 2.5 cm × 8–10 mm, puberulent.

Distribution

Eastern Siberia, Russian Far East, Mongolia [northern regions], Mainland China [northeastern, northern, southwestern regions], Korean Peninsula [Hamgyeongbuk-do (Mt. Baekdusan), Gangwon-do], Bhutan, North America



Cypripedium guttatumis is an ornamental orchid with a flower lip specialized into the shape of a spoon or bag and purplish red markings. The orchids have high ornamental value with elegant appearance, beautiful color and unique flowers.

C. guttatum does not have a wide range of adaptability, and its growth is greatly restricted. The orchids are dependent on insect pollination and their setting percentage of seeds is very low. Dense testae seriously affect seed germination. Accordingly, it is difficult to reproduce and cultivate the species. The orchids that are used for ornamental purposes generally depend on destructive excavation from the wild. Additionally, human activities such as logging, farming, and road building lead to habitat destruction, causing their populations to decline sharply.

Written by Wei Cao

Cypripedium japonicum Thunb.

Orchidaceae

- 扇脉杓兰
- クマガイソウ
- 광릉요강꽃

The genus *Cypripedium* L. is known as Lady's Slipper Orchids, and about 45 taxa are native to temperate regions of the Northern hemisphere. The genus belongs to the subfamily Cypripedioideae, which is located at the base group phylogenetically (Cameron et al., 1999; Cox et al., 1997; 1998). *C. japonicum* is in Section *Flabellinervia* and closely related to C. *formosanum* Hayata (Li et al., 2011; Fatibab et al., 2011). The shape of the flowers and leaves are beautiful, which has resulted in its over-exploitation. Accordingly, the plant has become endangered in natural habitats, conservation strategies for this species are urgently required, including habitat protection for genetic diversity.

Written by Hye Jin Kwon

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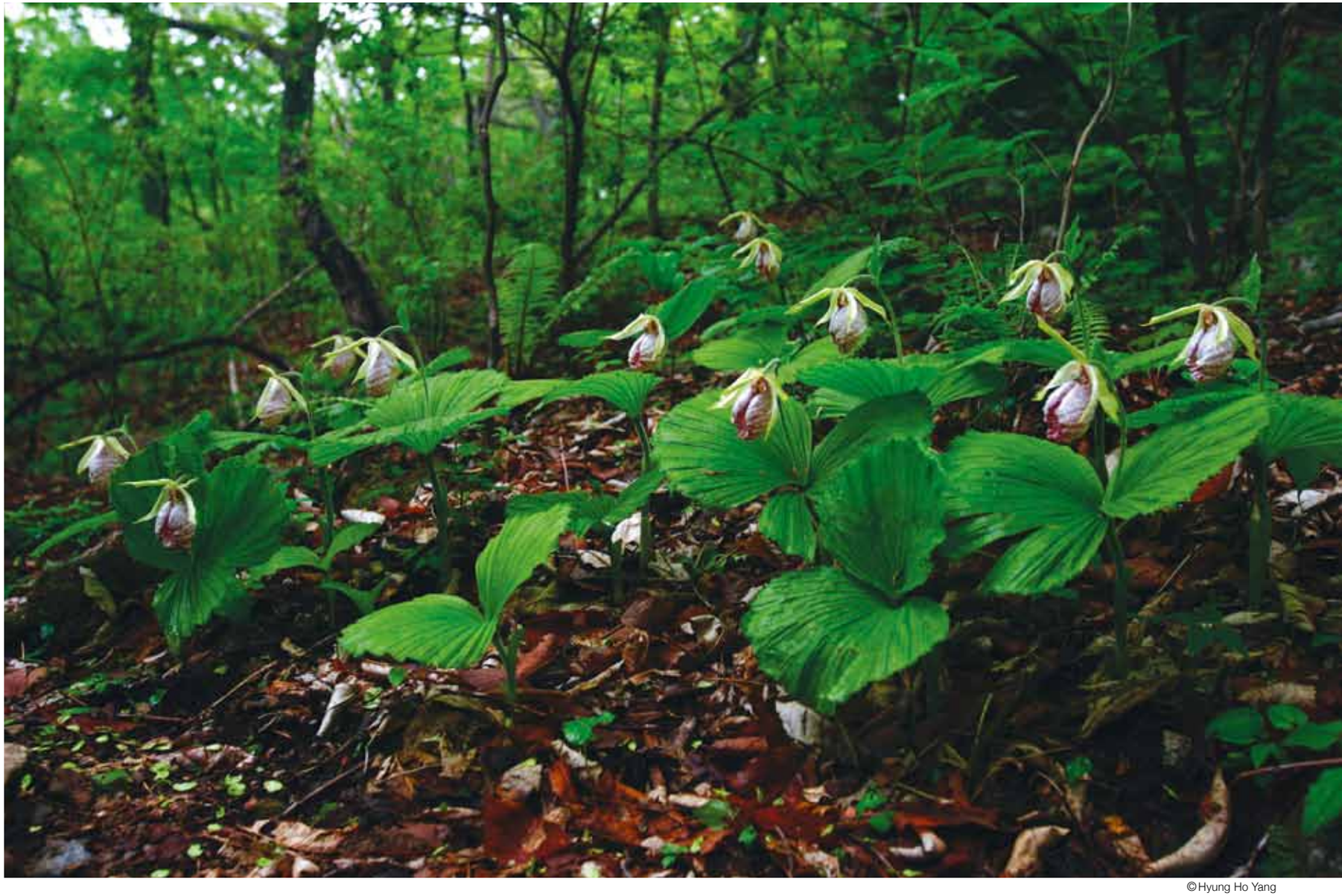

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Description

Herbs perennial, 20–40 cm tall. Rhizomes extending sideways. Stems erect, leafy with 3–4 lower leaves and 2 upper leaves. Upper leaves sub-opposite, fan-shaped, 10–22 cm wide, many nerved, hairs on the back, no petioles. Flowers hang towards the ground, 8 cm in diam., light green turning red with hairy axis, 15 cm long; 1 bact. Upper sepal oblong, 4.0–5.5 cm long, 1.2–2.0 cm wide. Petals sac-shaped, reddish purple veined. Fl. Apr–May.

Distribution

Mainland China [Anhui, S Gansu, Guizhou, Hubei, Hunan, Jiangxi, S Shaanxi, Sichuan, Zhejiang], Korean Peninsula [Gyeonggi-do (Mt. Jugyeopsan, northern regions)], Japanese Archipelago [Hokkaido, Kanto, Kansai, Shikoku], Taiwan Islands [Hualien, Ilan]

Cypripedium macranthos Sw.

Orchidaceae

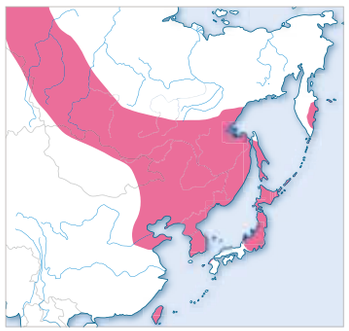
- 大花杓兰
- アツモリソウ
- 복주머니란
- Башмачек крупноцветковый
- 奇萊喜普鞋蘭

Description

Herbs perennial, 25–50 cm tall. Rhizomes stout, short. Stems erect, slightly pubescent or glabrescent, with several sheaths at the base. Leaves 3 or 4, elliptic or elliptic-ovate. Inflorescence terminal, 1 or 2-flowered. Flowers red or pink, usually with darker stripes, rarely white. Petals not twisted, lanceolate, 4.5 cm long, 2.5 cm wide. Lip deeply pouched, subglobose, 5.5 cm long, with a small mouth up to 1.5 cm in diam. Fruits capsule, ellipsoid.

Distribution

Eastern Siberia, Russian Far East, Mongolia [northeastern regions], Mainland China, Korean Peninsula [except Jeju-do], Japanese Archipelago [Hokkaido, Honshu], Taiwan Islands



Cypripedium macranthos is distributed over large areas in northern and eastern Asia in different ecosystems (from warm temperate forests of southeastern China to tundras of Commander Islands), but remains rare throughout the region. This species demonstrates a complex of unique adaptations to contrasting climatic conditions due to its ability to develop mycorrhizal symbiosis. Written by Pavel V. Krestov

Dendrobium huoshanense C. Z. Tang & S. J. Cheng

Orchidaceae

霍山石斛

© Hongwen Huang

Description

Herbs epiphytic. Stems fleshy, 3–9 cm, gradually tapering from base to apex, with many nodes. Leaves 2–5, alternate, leathery, ligulate-oblong or oblong-lanceolate, 9–21 cm long, 5–15 mm wide. Inflorescences from leafy or old leafless stems, 1–3-flowered. Flowers yellowish green, lip rhombic, white or pale yellowish green, tinged with pale brown, disk often with a green or yellow basal callus and dense white hairs. Fl. May.

Distribution

Endemic to Mainland China [SW Anhui (Huoshan), Hubei, SW Henan]

Dendrobium extract (Shi Hu in Chinese) has been used as a traditional herbal medicine in China for more than 1,300 years. First described in 1984, *D. huoshanense* is a well known medicinal species endemic to China and categorized as top-class and has long been ranked as one of the top three most precious herbs. The extract is used to treat throat inflammation, cataracts, chronic superficial gastritis and improve the immunity of the human body. *D. huoshanense* has a very narrow distribution, confined to Dabie Mountain in Anhui, Hubei and Henan provinces. Due to excessive exploitation, wild *D. huoshanense* is endangered and is now listed as Critically Endangered on the IUCN red list. The preservation of its germplasm resources primarily depends on in vitro propagation technology. However, it is difficult to carry out large-scale artificial cultivation of *D. huoshanense* due to the low survival rate of test-tube platelets. Seed propagation is beset with problems of poor seed viability due to lack of endosperm.

Written by Hongwen Huang

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Dracocephalum palmatum Steph. ex Willd.

Lamiaceae

Змееголовник дланевидный

© Vyacheslav Barkalov

Description

Herbs perennial, 5–12 cm tall. Stems hairy, with creeping rhizomes. Leaves ovate, lobed at the edge, hairy, 0.5–2.0 cm long; petioles hairy. Corolla blue-violet, 20–30 mm long, with pale-blue petals, hairy, upper lip longer than lower. Nuts 2 mm long, 1 mm wide. Fl. Jul.

Distribution

Russian Far East, Europe, North America [California]

© Vyacheslav Barkalov

Dracocephalum palmatum grows in a variety of habitats under climatically and ecologically extreme conditions of the high Arctic and in alpine ecosystems. Its wide distribution is probably connected with Pleistocene cooling and aridization. In Northeast Asia, it marks the process of migration of xeric species northward, to the Bering land bridge and ice free part of Alaska. At present, this species occurs in contemporary refugia that represent relic steppes in boreal and Arctic zones of Eurasia. Their history is similar to that of several boreal species, including *Orostachys spinosa*, *Koeleria cristata*, and *Artemisia santolinifolia*.

Written by Pavel V. Krestov

Eriocaulon heleocharioides Satake

Eriocaulaceae

■
コシガヤホシクサ

This species has been categorized as 'extinct in the wild' on the Japanese Red List (Japanese Ministry of Environment, 2012). In Sanuma Lake (the last natural growth area), the water level has been managed by local farmers since the Edo period. In the traditional water management system, farmers keep the water level high in summer for agricultural use, then gradually lower it during autumn, and maintain it at low levels in winter. This species is likely to adapt to these seasonal fluctuations in water level. The plants germinate in March–May, and grow underwater in April–August. During September, they extend their peduncles to the water surface, then bear flowers and fruits from September to November. However, in the natural distribution sites, local farmers changed the water management style to maintain water levels during a summer drought in 1994, resulting in high water levels after September, including during the species reproductive season. In 1995, this species was not found at all, and it has since been regarded as extinct in the wild. In 2008, Tsukuba Botanical Garden, Natural Museum of Nature and Science and local farmers agreed to restore the water management to the traditional method, and a restoration project has since been ongoing.

Written by Haruka Ohashi

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Description

Herbs annual, hydrophytes; occurring in riverbeds and edges of irrigation ponds. Leaves tufted, linear, 7–15 cm long, 2–3 mm wide. Caudex erect, 10–15 mm long, 7–11 mm wide. Peduncles numerous, 12–28 cm long. Flowers in dense heads. Heads white, ovoid-conical, 6–7 mm long, ca. 5 mm in diam.

Distribution

Endemic to Japanese Archipelago [Moto-Arakawa River, Sanuma Lake: but extinct]

Euryale ferox Salisb.

Nymphaeaceae

- 芡实
- オニバス
- 가시연꽃
- Эвриала устрашающая

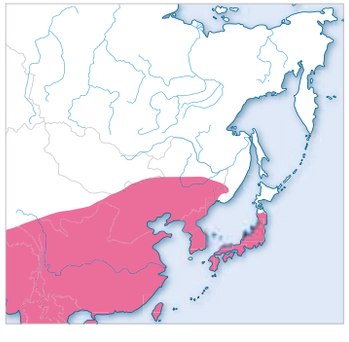
©Hyung Ho Yang

Description

Herbs annual or perennial, aquatic; covered in sharp prickles, with large and round floating leaves. Leaves quilted, more than 1 m wide, with a leaf stalk attached to the center of the lower surface, purplish above, green beneath. Flowers 5 cm in diam., purple-violet. Sepals 4, connate at base, not petaloid, spiny outside. Petals lanceolate, smaller than sepals, 2.5 cm long. Fruits irregularly dehiscent, fleshy. Seeds large, arillate. Fl. Jul–Aug.

Distribution

East Asia to India, rare in the northern part of the range: Russian Far East, Mainland China, Korean Peninsula, Japanese Archipelago [Honshu, Kyushu], Taiwan Islands



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Euryale is widely occurring in water ponds of East and South Asia; however, it is considered a rare species in natural aquatic ecosystems, especially in the northern part of its distribution area. *Euryale* belongs to the ancient floristic complex that was formed in the Tertiary and possibly survived Pleistocene climatic catastrophes in numerous aquatic refugia across northern Asia. The species has some primitive features in its organization (three-nucleus pollen grains) and a wide spectrum of adaptations to different conditions (can be annual or perennial). This species is considered rare in Russia, and its natural populations must be strictly protected. A similar history is characteristic of other aquatic species, including *Nelumbo nucifera* and *Nuphar japonicas*.

Written by Pavel V. Krestov

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Euryodendron excelsum Hung T. Chang

Theaceae

猪血木

© Hongwen Huang

Description

Trees evergreen, 15–25 m tall. Bark grayish brown or grayish black. Leaves elliptic, oblong or oblong-elliptic, 5–9 cm long, 1.7–3.0 cm wide, thinly leathery, dark green adaxially and pale green abaxially, both surfaces glabrous; petioles 3–5 mm. Flowers white, 5–6 mm in diam.; pedicels 4–6 mm, sparsely pilose. Fruits bluish black when mature, ovoid to subglobose, 3–4 mm in diam., with 2 or 3 seeds per locule. Fl. May–Jul, fr. Oct–Nov.

Distribution

Endemic to Mainland China [Guangdong (Yangchun), Guangxi (Bama, Pingnan)]

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Euryodendron excelsum belongs to the genus *Euryodendron* of the family Theaceae. *Euryodendron* is a monotypic genus and *E. excelsum* is the only identified species. *Euryodendron excelsum* is endemic to South China, with a very narrow geographical distribution restricted to Guangdong (Yangchun) and Guangxi provinces (Bama, Pingnan) in China. Exhaustive field investigations in the last decade have indicated that *E. excelsum* plants in the two distribution sites of Guangxi province were completely extinct. Only one remaining population survives in the Bajia town of Guangdong province. About 100 plants including 10–14 old trees occur in this population, and they are under threat due to increasing agricultural activities, local tourism and habitat fragmentation. *Euryodendron excelsum* has been listed as critically endangered in the 2008 IUCN Red List of Threatened Species and the China Plant Red Data Book.

Written by Hongwen Huang

Fagus crenata Blume

Fagaceae

ブナ

일본주름너도밤나무

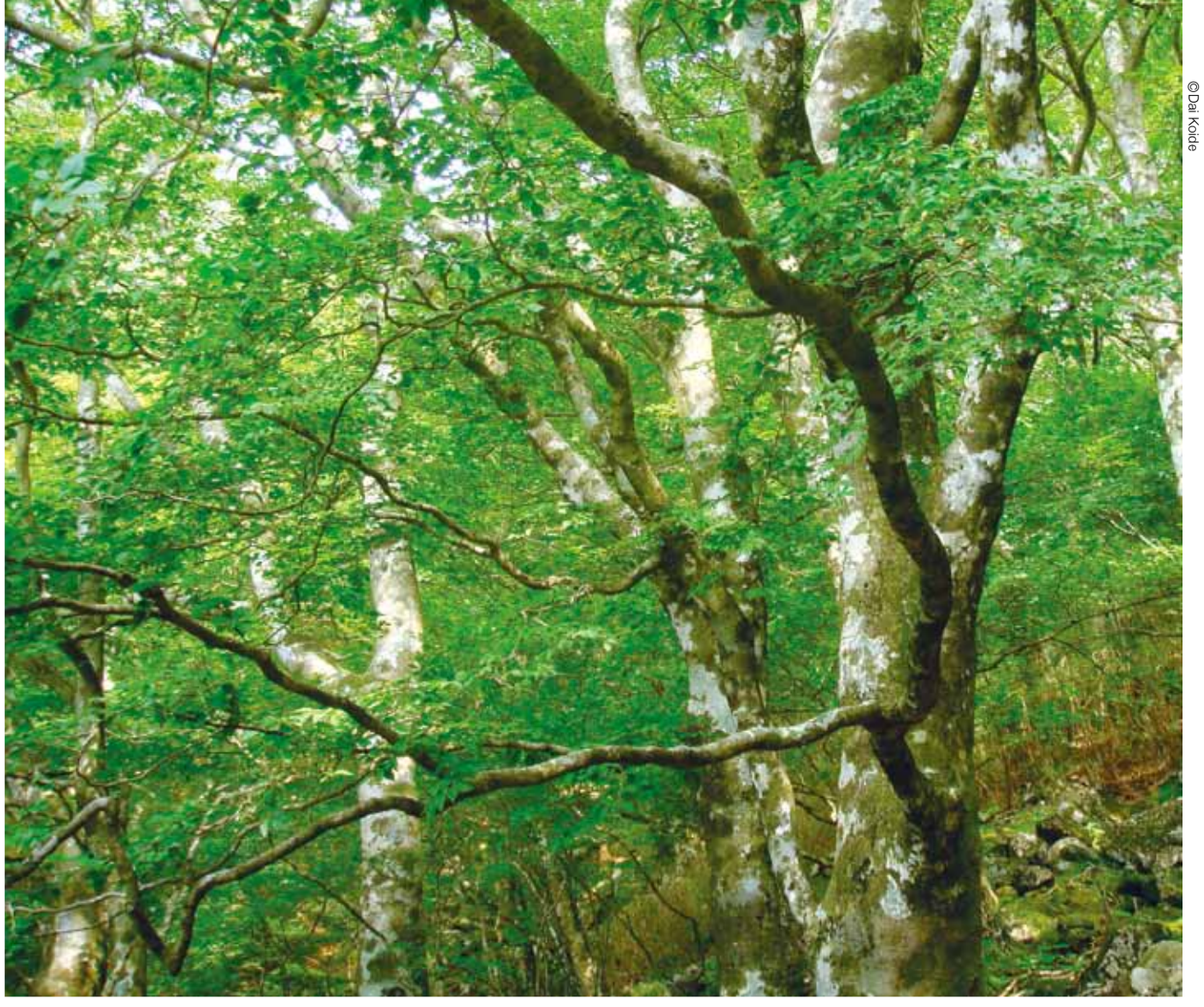
© Tetsuya Matsui

Description

Trees deciduous, 30 m tall, 1.5 m in diam. Bark gray. Leaves 4–9 cm long, 2–4 cm wide, ovate with crenate margin. Male inflorescences hang down from axils of the lower branch. Female inflorescences rise from axils of the upper branch. Nuts 3-angled, 2.0–2.5 cm long, edible with less tannin than *Quercus*.

Distribution

Endemic to Japanese Archipelago [southern peninsula of Hokkaido Island to Kyushu Island]



© Dai Koide

This beech species forms pure forests in the snowy Japan Sea/East Sea side, where it reproduces vigorously because of very high tolerance to snow pressure and high survival rate of seeds under snow cover. The snow cover hides beech nuts from rodents and preserves suitable moisture of nuts. On the less snowy Pacific Ocean side, mixed beech forests with other tree species occur. Despite the current dominance in the cool-temperate zone, beech was rare in glacial eras according to fossil and pollen records. After the last glacial maximum (about 21,000 years ago), the distribution of beech spread from coastal refuges, following climate warming and snow increase by an inflow of the Tsushima warm current through increasing sea levels. Through range expansion, beech has two clades dividing the Japan Sea/East Sea and Pacific Ocean populations. Japan Sea/East Sea populations have lower genetic diversity, suggesting bottlenecks through severe coldness in the region or limited founding populations. Several traits such as leaf size, phenology, and physiology also differs between the two clades.

Written by Dai Koide

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Fagus hayatae Palib.

Fagaceae

- 台湾水青冈
- 臺灣水青岡, 臺灣山毛櫸, 早田氏山毛櫸

©Wei-Yu Wang

Description

Trees deciduous, 13 m tall. Leaves elliptic to ovate, 4–6 cm long, 2.4–2.8 cm wide, margin serrulate or rarely double-serrulate. Monoecious. Flowers appearing with young leaves. Male inflorescences umbellate heads, flowers 5–6 fascicled on a peduncle. Stamens 5–12. Female inflorescences with many bracts forming a connate involucre. Styles three, hairy. Fruits globose-ovoid, cupules puberulent, splitting into four valves. Seeds nuts, 3-winged. Fl. Mar–Apr.

Distribution

Mainland China [Hubei, Hunan, Shaanxi, Sichuan, Zhejiang], Taiwan Islands [northern regions, mainly in mountain ridges at elevations between 1,340–2,025 m]

Beech is one of the most common and widespread broad-leaved forest trees in temperate areas. The population in Taiwan is located on the southern distribution limit of this genus. Beech has significant value for phytogeographical research. *Fagus hayatae* is a glacial relic species only distributed in mainland China and Taiwan. Pollen evidence indicates that *Fagus* was once distributed in the low altitude of northern Taiwan during the glacial age (Liew and Huang, 1994). However, at the end of the last glacial age, the warmer climate forced the beech to immigrate into the higher altitude habitat. Currently, it is only found in the middle altitude of northern Taiwan and a few of areas in mainland China. In addition, a rare and endemic butterfly, *Sibataniozephyrus kuafui*, which only utilizes *F. hayatae* as its larval host, was found in 1994 (Yen and Jan, 1995). The *F. hayatae* has been designated as a "valuable and rare plant", and some of its habitats have been turned into preserves by the "Cultural Heritage Preservation Act" in Taiwan.

Written by Chien-Fan Chen

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The allied species, *Fagus hayatae* var. *zhejiangensis* M. C. Liu & M. H. Wu ex Y. T. Chang & C. C. Huang and *F. pashanica* C. C. Yang, previously recorded in China, is recognized as a synonym under *F. hayatae* (Huang et al., 1999).

©Chien-Fan Chen

Fagus multinervis Nakai

Fagaceae

너도밤나무

Description

Trees broad-leaved, deciduous, 20 m tall. Stems erect. Bark light gray, smooth. Leaves alternate, ovate, elliptical, apex acute, base rounded or subcordate, 6–12 cm long, white hairy, yellow-greenish back, denticulate, 8–10(–13) veined. Monoecious. Male flowers capitated, hairy, 2.5 cm long. Female flowers 2 per cupule, 4–6 petals, 3 styles, 3 ovaries, one ovule ripens among two ovules in each ovary. Cupule ovate, surrounded by bracts. Fl. May, fr. Oct.

Distribution

Endemic to Korean Peninsula [Ulleung-do Island]

The nomenclatural taxonomic history of the species is complex, resulting in different scientific names for the species: *Fagus engleriana* Seemen ex Diels in Korea, *F. japonica* var. *multinervis* (Nakai) Y.N. Lee in IPCN Plant Lists, and *F. multinervis* Nakai, as well as several others. *F. multinervis* was treated as the synonym of *F. engleriana* distributed in China (Anhui, N Guangxi, S Guizhou, Henan, NW Hubei, Hunan, Shaanxi, E Sichuan, Yunnan, and Zhejiang) by Shen (1992). However, Oh and Youm (2014) demonstrated that *F. engleriana* (China) and *F. japonica* (Japan) formed a clade (closely related relationship), and that *F. multivervis* is genetically distant from the two species; therefore, they treated *F. multivervis* as independent species. It is postulated that *Fagus* originated from the North Pacific region (Denk and Grimm, 2009). During repeated glacial and interglacial periods in the Cenozoic quaternary, the land bridges among China, Japan, and Korea facilitated plant dispersals among countries. It is proposed that *F. multinervis* was derived from Chinese primogenitors, which were isolated after settlement of the Korean Peninsula following speciation (Winkler and Wang, 1993).

Written by Gyu Young Chung & Kyong Sook Chung

Ferula feruloides (Steud.) Korovin

Apiaceae

- 多伞阿魏
- Залаархаг хаврага, Чийр
- Ферула

Description

Herbs perennial, 1 m tall. Roots fusiform. Stems stout, solitary, rarely 2–4, sparsely pubescent, paniculate-branched from middle, branches verticillate, occasionally alternate. Basal leaves broadly ovate, ternate-4-pinnate/pinnatifid; ultimate segments ovate, ca. 10 mm, usually parted; lobules entire or toothed, densely pubescent, deciduous. Inflorescences copiously cymose-branched, often several simple umbels successively verticillate on the same branch, forming a crowded moniliform raceme. Umbels ca. 2 cm wide; bracts absent; rays 4, subequal. Bracteoles small, deciduous, umbellules ca. 10-flowered. Stylopodium depressed-conic. Fruits ellipsoid, 3–7 × 1.5–3.0 mm. Vittae 1 in each furrow, 2 on commissure. Fl. May, fr. Jun.

Distribution

Western Siberia, Mongolia [Mongolian Altai, Dzungarian Gobi phytogeographical regions], Mainland China, Kazakhstan, Kyrgyzstan, Uzbekistan

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Ferula feruloides is widely distributed in western Siberia and Central Asia. It is used in folk medicine as an antihelmintic and lactogenic agent and in veterinary medicine to treat abscesses. Phenylcarboxylic acids, steroids, and terpenoids were isolated from the roots of *F. feruloides*. Essential oils were observed. Fruits yielded coumarins.

The life span of *F. ferulaeoides* continues 10–12 years, and its flowering period takes 35–40 days, and seed production extends 30–40 days. This is a flesh rooted monocarp plant, and its root has asymmetric and asynchronous structure. The number of leaves of *F. ferulaeoides* increases from year to year and the leaf biomass reaches 10–11 kg/ha. Roots contain resins, polysaccharides, proteins, volatile oils and cumarins. Leaves contain proteins, celluloses, lipids and starches. Seed production of *F. ferulaeoides* is rather high as a single plant able to produce about 150,000 seeds, which can lie in dormant condition for three to four years.

Written by Magsar Urgamal & Badamdorj Bayartogtokh

Ferula mongolica (V. M. Vinogr. & Kamelin) V. M. Vinogr. & Kamelin

Apiaceae

- 蒙古呵魏
- Монгол хавраг
- Ферула монгольская

©Dashzeveg Nyambayar

Description

Herbs perennial, 1.0–1.5 m tall. Roots fusiform. Stems stout, solitary, rarely 2–4, sparsely pubescent. Basal leaves broadly ovate, ternate-4-pinnatifid, densely pubescent, deciduous. Fruits ellipsoid, vittae 1 in each furrow, 2 on commissure. Fl. May, fr. Jun.

Distribution

Mongolia [Khangai, Mongolian Altai, Great Lakes Depression, Dzungarian Gobi, Transaltai Gobi phytogeographical regions], Mainland China

©Batlai Oyuntsetseg

Ferula mongolica is an important medicinal plant in Mongolia that grows in western Mongolia.

Written by Magsar Urgamal

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Fraxinus mandschurica Rupr.

Oleaceae

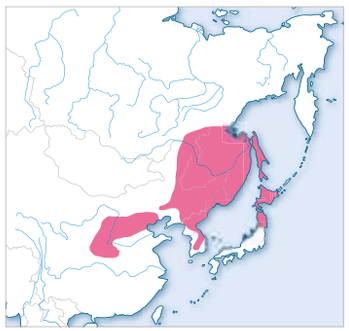
- 水曲柳
- ヤチダモ
- 들메나무
- ясень маньчжурский

Description

Trees broad-leaved, deciduous, ca. 30 m tall. Leaves 25–35 cm, axis with ridges; leaflets 7–11, subsessile, joint brown curly hairy, oblong to ovate-oblong, 5–20 × 2–5 cm, papery, margin serrulate. Panicles lateral at branches of the previous year, 15–20 cm. Dioecious. Flowers polygamous, staminate panicles congested, bisexual ones somewhat lax, appearing before leaves. Samaras oblong to obovate-lanceolate, 3.0–3.5 cm × 6–9 mm. Wing decurrent to middle or base of nutlet, obviously twisted. Fl. Apr, fr. Sep–Oct.

Distribution

Russian Far East, Mainland China [northeastern, northern regions], Korean Peninsula [Hamgyeongbuk-do, Hamgyeongnam-do, Pyeonganbuk-do, Pyeongannam-do, Hwanghae-do, Gangwon-do, Chungcheongbuk-do, Gyeongsangbuk-do, Jeollabuk-do], Japanese Archipelago



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© Wei Cao

Fraxinus mandshurica (ash) is a well known hard timber tree in northeast China. The ash is a Tertiary relic tree. The tree was confirmed as a class II plant under state protection in China in 1999.

The ash is suitable for light, warm and humid climates, but not for wet climates. It is found in mountain valleys, but sometimes suffers from frost damage during the early spring. The plants have good natural regeneration with seed provenance. However, the mortality of the ash seedlings under the canopy is high. Their matured seeds primarily spread under the action of wind. Rodents seasonally carry the seeds, leading to changes in the ash pattern. Pure stands of *Fraxinus mandshurica* are rarely found in large areas, and are instead sporadic patches or scattered. The wood has a wide range of uses due to characteristics such as straight trunk, dense, hard and tough timber, straight and nice texture, decay resistance and water resistance. *Fraxinus mandshurica* trees with large diameters are currently decreasing in number, and it will be necessary to protect these trees in the future.

Written by Yonghuan Jin

Ginkgo biloba L.

Ginkgoaceae

- 银杏
- 은행나무

©Hongwen Huang

Description

Trees deciduous, 20–35 m tall. Leaves fan-shaped, long petiolate, pale green, turning yellow in autumn, 13 cm long, usually 5–8 cm wide, spirally dispersed on long branchlets, divided by a deep, apical sinus into 2 lobes that are each further dissected, clustered on short branchlets, with undulate distal and margin notched apex. Dioecious, rarely monoecious. Staminate strobili ivory colored, pollen sacs boat-shaped, with widely gaping slit. Seeds elliptic, narrowly ovoid or subglobose. Fl. Mar–Apr, fr. Sep–Oct.

Distribution

Endemic to Mainland China, but widely planted in Korea and Japan [Native in Zhejiang (Tianmu Shan Reserve), widely and long cultivated in Anhui, Fujian, Gansu, Guizhou, Henan, Hebei, Hubei, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan]

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Ginkgo biloba, also known as the maidenhair tree, is a relict species of the Mesozoic era, with fossils recognizably related to modern ginkgo from the Permian, dating back 270 million years. The most plausible ancestral group for the order Ginkgoales is the Pteridospermatophyta, also known as the "seed ferns", specifically the order Peltaspermales. Although *G. biloba* and other species of the genus were once widespread throughout the world, its range shrank until two million years ago, since when it has been restricted to a small area of China. For centuries, it was thought to be extinct in the wild, but is now known to grow in at least two small areas in the Tianmushan Reserve in Zhejiang province in eastern China. *G. biloba* has been widely cultivated as an ornamental plant, probably for more than 3,000 years. This plant provides shade and is tolerant of a wide range of climatic and edaphic conditions, including pollution. Ginkgo has long been cultivated in China, and some trees planted at temples are believed to be over 1,500 years old. Because of its status in Buddhism and Confucianism, the ginkgo is also widely planted in Korea and parts of Japan, and some naturalization has occurred in both areas, with ginkgo spreading into natural forests. The wood is used in furniture making, the leaves in medicines and pesticides, and the roots as a cure for leucorrhea. In addition, the seeds are edible and the bark yields tannin.

Written by Hongwen Huang

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Glaucidium palmatum Siebold & Zucc.

Ranunculaceae

シラネアオイ

팔마툼글라우키디움

©Haruka Ohashi

Description

Herbs perennial, 15–30 cm tall; occurs on forest edge, forest floor, and snowy valley. Rhizomes stout. Leaves long petiolate; cauline leaves reniform or cordate-orbicular, 8–20 cm long and as wide, palmately 7- to 11- lobed, and irregularly acute-toothed. Flowers terminal, solitary. Sepals four, broadly ovate, pink. Stamens many. Pistils two. Follicles ca. 15 mm long. Seeds flat, attached with a wide wing. Fl. May–Jul.

Distribution

Endemic to Japanese Archipelago
[SW Hokkaido to central Honshu]

©Haruka Ohashi

©Haruka Ohashi

This species is palaeo-endemic in Japan. Since the geographical distribution of this species is concentrated in a region of heavy snowfall, it is assumed to be adapted to regulated temperature under thick snow in winter and short growing period after thawing. Glaucidiaceae is a monotypic family. Molecular analysis has indicated that this species is related *Hydrastis canadense* (Ranunculaceae) in North America, and included in Ranunculaceae in the APG III classification. However, this species has several morphological features that Ranunculaceae do not, including dehiscent fruits that open from both the inner and outer suture. The Japanese name ('Shirane-aoi') originates from the large population in Mt. Shirane in central Japan; however, this population drastically decreased in the early 1990s owing to heavy browsing pressure due to an increase in the Sika deer (*Cervus nippon* Temminck) population. Currently, this population is only surviving inside deer-proof fences.

Written by Haruka Ohashi

Gleditsia vestita Chun & F. C. How ex B. G. Li

Fabaceae

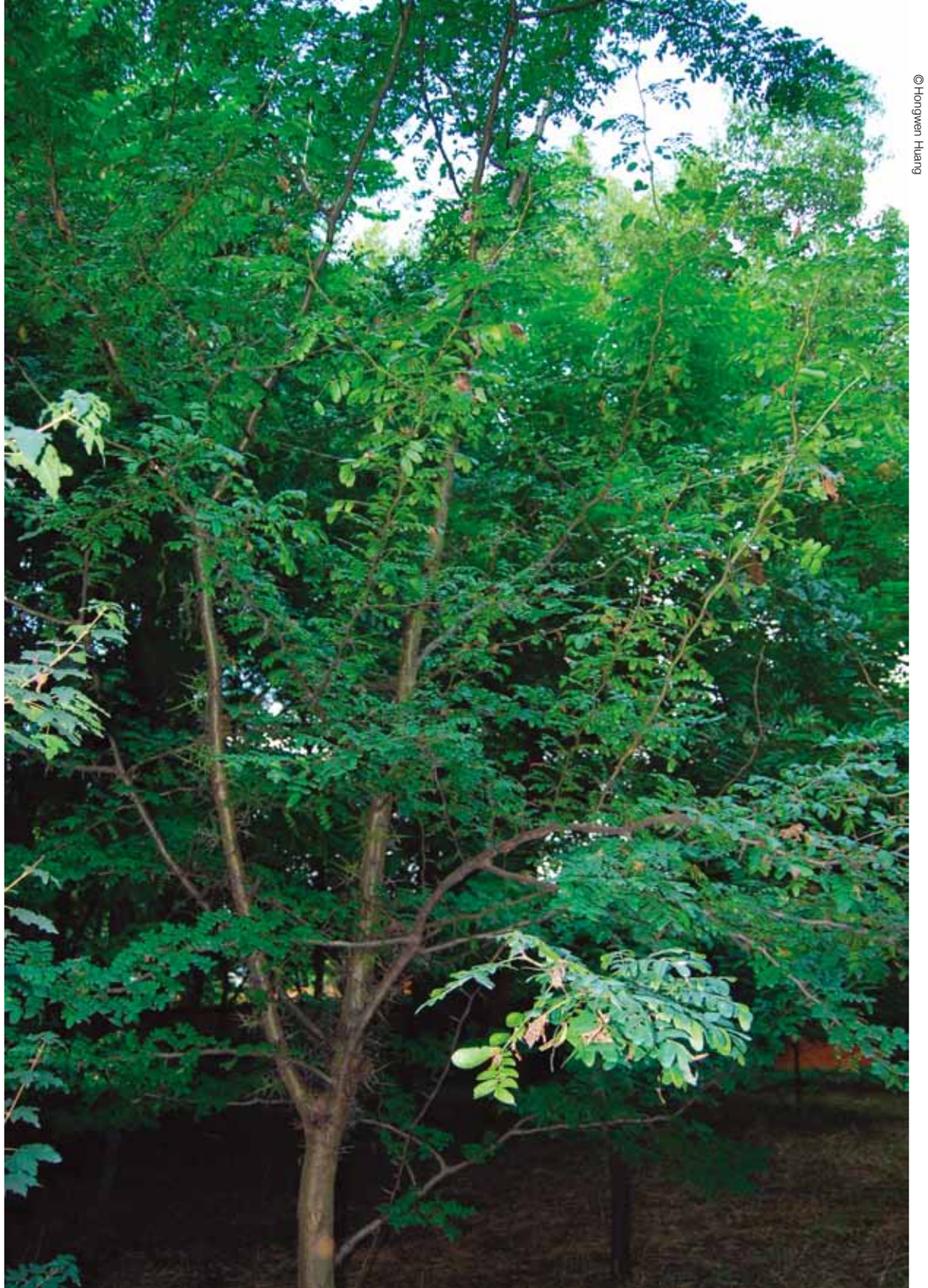
绒毛皂荚

Description

Trees 25 m tall. Spines 2–16 cm long. Leaves pinnate; leaflets 3–10 pairs, ovate-oblong, 2–9 cm long, 1–4 cm wide. Stipes 1.5–4.0 cm long, valves leathery, often bullate, glabrous or velutinous, shiny. Flowers yellowish green, in axillary or terminal, puberulent spikes. Legumes densely yellowish green velutinous, compressed, strap-shaped, irregularly twisted or falcate, apex with short beak. Seeds numerous, deep brown, elliptic, 9–10 mm long, 5–7 mm wide, smooth. Fl. Apr–Jun, fr. Jun–Dec.

Distribution

Endemic to Mainland China [Hunan (Hengshan)]



There are almost 16 species in this genus worldwide. The type specimen of *G. vestita* was collected by Chun Woonyong and How Foon-chew in Hunan province in 1954, and after almost thirty years it was published as a new species owing to its densely yellowish green velutinous legumes (Li, 1982). Now *G. vestita* is treated as a synonym of *Gleditsia japonica* var. *velutina* L. C. Li (Li, 1982; Chen et al., 2010). *G. japonica* is distributed in Japan, China and Korea, but *G. japonica* var. *velutina* (*G. vestita*) only occurs in the scattered forest in the valley and in Hengshan in the middle of Hunan province, giving it a very narrow distribution in China. When this species was first found in 1954, there were only five individuals. Only one of the trees produces seeds, and human activity frequently destroy the balance of the forest's ecological system. As a result, this species is faced with extinction in the wild, and is now listed as critically endangered species (CR) worldwide according to IUCN Version 2.3 and as a first grade species requiring national protection in China. A great deal of research has been conducted to present this species, including evaluation of its botanical and ecological characteristics, distribution, cause of reduction and development of techniques for propagation and cultivation through seeds, cuttings and grafting. This tree can be planted for ornamental shade and hedge purposes in mountain areas, hills and flatlands of the sub tropics of China. The bright brown or reddish heartwood, with its thin layers of pale yellow sapwood, is hard. Its lumber is used for rough construction, furniture, interior finishes and turnery.

Written by Hongwen Huang

Halimodendron halodendron (Pall.) Druce

Fabaceae

- 铃铛刺
- Мөнгөлөг хонхот харгана

Description

Shrubs 0.5–2.0 m tall. Bark reddish-brown, strongly pungent; spines 2–6 cm long; stipules triangular or subulate, turning into spines 1–4 mm long; petioles very short. Leaves imparipinnate, 3–4 cm long, ending with spine; leaflets in 1–5 pairs, oblanceolate, with dense silver-white hairs at first, then glabrous. Racemes 2–5-flowered. Corolla purple, rarely white. Legumes inflated, glabrous, coriaceous, rugose, obovoid, 1–3 cm long, 5–15 mm wide. Seeds reniform. Fl. Jun, fr. Aug.

Distribution

European Russia, Mongolia [Mongolian Altai, Great Lakes Depression (southern slope of Tanna Mountain in Shargyn Gobi), Trans-Altai Gobi (Aj Bogd Mountain), Dzungarian Gobi (Bulgan river)], Mainland China, Afghanistan, Armenia, Azerbaijan, Iran, Georgia, Kazakhstan, Kyrgyzstan, Pakistan, Turkmenistan, Turkey, Ukraine, Uzbekistan

It is named for Russian salt tree native to Russia, Southern Asia and Mongolia. They are very rare in Mongolia growing on steppe and dry sandy soil near the ocean. This species has saline and drought tolerance. It is used as forage in China. Recently, some antimicrobial and antioxidant compounds have been found, but little is known on this species.

Written by R. Tungalag

Hanabusaya asiatica (Nakai) Nakai

Campanulaceae

- ハナブサソウ
- 금강초롱꽃

Description

Herbs perennial, 30–90 cm tall. Stems erect. Cauline leaves alternate, 4–6 leaves on the middle part of the stem, ovate-elliptic, 5.5–15.0 cm long, 2.5–7.0 cm wide, apex acute, base round, margin involute, irregularly dentate. Flowers gamopetalous, light purple or white, 4.5–5.5 cm long, ca. 2 cm in diam. Calyx 5-lobed, linear-lanceolate, margin dentate, 8.0–12.0 mm long, 1.2–2.0 mm wide. Stamens 5, syngenesious with wrap pistil. Pistil 1, shorter than floral tubes; stigma long, segregated into three parts. Ovary inferior, 3-carpels. Capsules many seeds, light brown, ellipsoid. Fl. Aug–Sep, fr. Oct.

Distribution

Endemic to Korean Peninsula [Gangwon-do, Gyeonggi-do (northern regions)]

Hanabusaya asiatica belongs to Korean endemic genus *Hanabusaya* Nakai in Campanulaceae, which was named after the location at which the genus was first described, Mt. Geumgangsan (Korean vernacular, common name only). The other species in the genus, *H. latisepala* Nakai, has been distinguished based on having ovate-lanceolate-shaped calyx lobes with a comparatively broader width (2.7–5.8 mm) and distribution in the northern part of Korea (Yoo, 2007), but the species has recently been treated as a synonym of *Hanabusaya asiatica* (Nakai) Nakai (The Plant List, 2014). The genera most closely related to *Hanabusaya* are *Campanula* L. and *Adenophora* Fisch.. *Symphyandra* is characterized as having only cauline leaves, with most leaves on the upper part of the stem, small and/or minute, segregated calyx lobes, and pistils attached to prominently raised receptacles. Although *Hanabusaya* and *Campanula* have syngenesious flowers and general morphological characteristics in common, *Adenophora* assembles with *Hanabusaya*. However, gamopetalous flowers and absence of glands characterize the genus well (Nakai, 1911). Cheon and Yoo (2013) recently suggested that the genus *Hanabusaya* is most closely related to Remotiflorae clade (*Adenophora remotifolra* (Siebold & Zucc.) Miq. and *A. grandiflora* Nakai) based on nrDNA ITS sequence data. Further research is required to understand the phylogenetic and geographic origins of the Korean endemic genus *Hanabusaya*.

Written by Gyu Young Chung & Kyong Sook Chung

Hopea chinensis (Merr.) Hand.-Mazz.

Dipterocarpaceae

狭叶坡垒

© Hongwen Huang

Description

Trees 15–20 m tall. Bark grayish black, smooth. Branchlets reddish brown. Leaves 7–26 cm long, 2–8 cm wide, oblong to oblong-lanceolate, base rounded or cuneate, slightly asymmetric, margin entire, apex acuminate or caudate-acuminate; petioles 0.6–1.0 cm long. Panicle axillary. Sepals imbricate. Petals reddish, elliptic, 3–4 mm long. Stamens (10–)15. Ovary ovoid, stylopodium cylindric. Styles short. Fruits dark brown, ovoid, winglike calyx segments oblong-lanceolate or oblong, 8–12 cm long, 2.5 cm wide. Fl. Jun-Jul, fr. Oct–Dec.

Distribution

Mainland China [SW Guangxi, SE Yunnan (Jiangcheng, Lüchun, Pingbian)], northern Vietnam

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Hopea chinensis, an important species of seasonal rainforests, is well-known for its timber quality and occurs in valley forests, forests on mountain slopes, and hills, with a scattered distribution only in south and southwest Guangxi, south and southeast Yunnan and northern Vietnam. Due to its wide range of morphological variations, many names were treated as synonyms, including *Shorea chinensis* Merril, *Hopea austroyunnanica* Y. K. Yang & J. K. Wu, *H. boreovietnamica* Y. K. Yang & J. K. Wu, *H. daweishanica* Y. K. Yang & J. K. Wu, *H. guangxiensis* Y. K. Yang & J. K. Wu, *H. hongayensis* Tardieu, *H. jianshu* Y. K. Yang et al., *H. mollissima* C. Y. Wu, *H. pingbianica* Y. K. Yang & J. K. Wu, and *H. yunnanensis* Y. K. Yang & J. K. Wu, these synonyms were treated as synonyms by Li et al (2007) in Flora of China. *H. chinensis* is an endangered species threatened by timber exploitation. In addition, the short seed life span and slow growth could account for the low restoration rate of *H. chinensis* once degraded. Suitable habitat loss and accordingly decreasing population size and scale caused by human activity are the main factors endangering *H. chinensis* (Huang et al., 2008). According to IUCN Version 2.3, its status is critically endangered and it is listed as a first grade species in need of national protection in China. The durable wood is used for making boats, furniture, and building bridges.

Written by Hongwen Huang

Hylotelephium ussuriense (Kom.) H. Ohba

Crassulaceae

- 乌苏里八宝
- 둥근잎꿩의비름

The genus *Hylotelephium* H. Ohba occurs in Asia, Europe, and North America, consisting of about 33 species, seven of which are found in Korea (Park, 2007). *H. ussuriense* was long recognized as a Korean endemic species until it was recently found on the coast of Vladivostok and the southern part of Ussuri, as well as along the Tuman River, Russia (Kim et al., 2000). The populations of species are very narrowly distributed in and near Mt. Juwangsan in Gyeongsangbuk-do province. Yoon (2011) confirmed that disjunct Russian and Korean populations are con-specific based on morphological and molecular features (nrITS and the cpDNA of trnL-F and rps16). It was postulated that *Hylotelephium* originated from Russian Far East (Gontcharova et al., 2005), but no mechanism for the speciation of *H. ussuriense* has been proposed. It is important to understand the boreal origin of the species *H. ussuriense* to explain the disjunctive, restricted distribution of the species in Korea.

Written by Gyu Young Chung & Kyong Sook Chung

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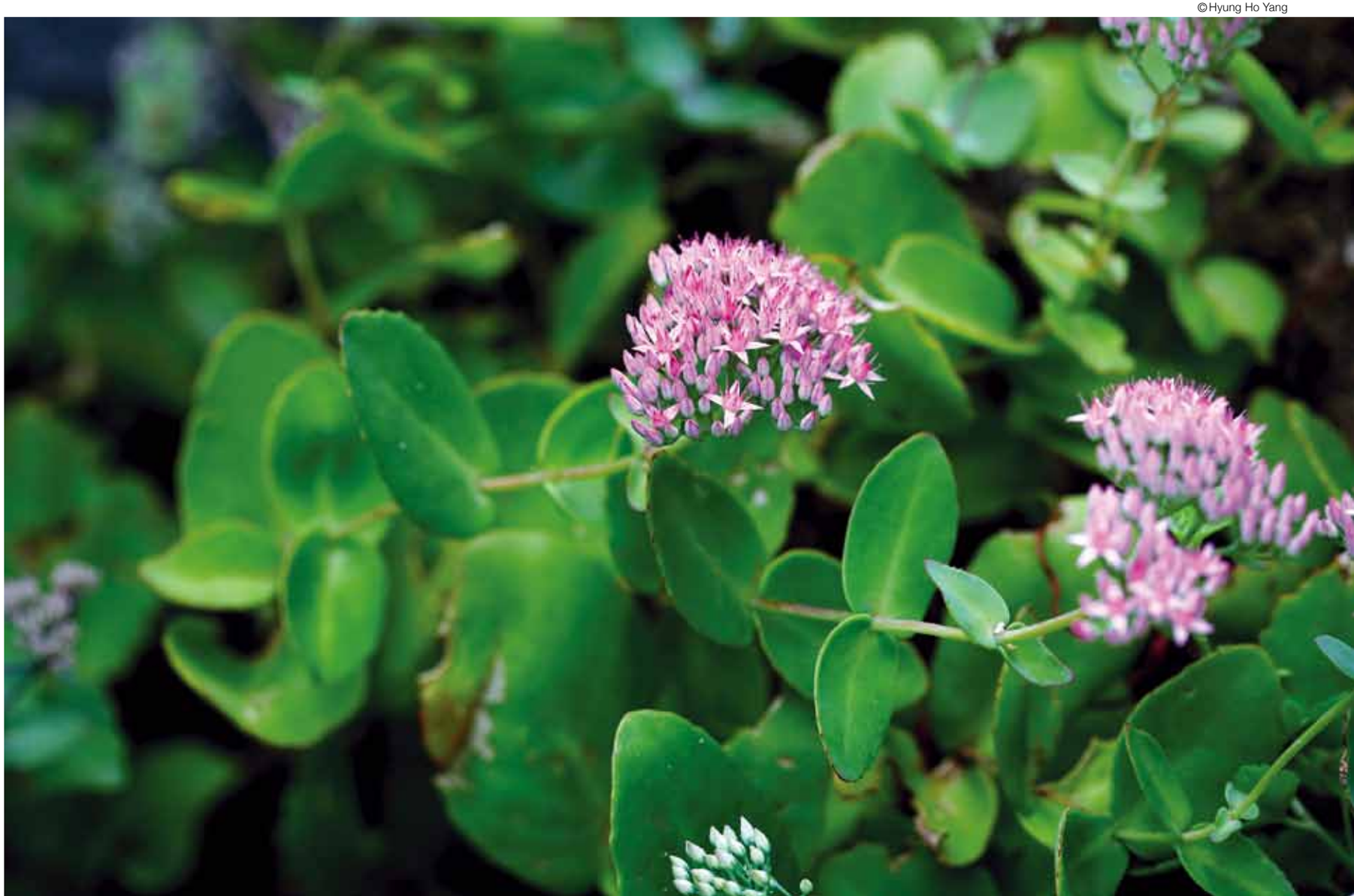

Description

Herbs perennial, 15–25 cm tall. Stems decumbent, reddish. Leaves opposite, ovate, orbicular, margin serrate, 2.5–4.5 cm long and wide; petioles sessile. Inflorescences corymb-like, terminated, reddish pink. Calyx 5-lobed, lanceolate, green. Stamens longer as petals; anther reddish. Carpels free. Follicles seeds ellipsoid, narrowly winged. Fl. Jul–Aug.

Distribution

Russian Far East [Ussuri], Korean Peninsula [Gyeongsangbuk-do (Mt. Juwangsan)]

Incarvillea potaninii Batalin

Bignoniaceae

聚叶角蒿

Потанины улаан тулам

©D. Suran

Description

Herbs perennial, 5–20 cm tall. Rhizomes ligneous, long, many-headed. Leaves alternate, usually clustered at stem base, 1-pinnately divided; leaflets 3–7, ovate, margin irregularly lobed or parted. Inflorescences racemes, terminal. Calyx campanulate, teeth subulate. Corolla red, funnelform, 3.5–5.0 cm long, lobes rounded, margin ciliate. Capsules terete, 3–5 cm long, apex acuminate. Seeds ovoid to subglobose. Wings 1.5–2.0 mm, membranous.

Distribution

Mainland China [Nei Menggu], Mongolia [Gobi Altai, Trans Altai Gobi, Alasha Gobi phytogeographical regions]

©D. Suran

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This plant is used in Mongolian traditional medicine for the treatment of deafness as well as stomach and intestinal disorders. Experiments to grow the plant from seeds were carried out in the Botanical Garden of the Institute of Botany, MAS and special cultivation agrotechnology was developed. In addition, the biology and embryology of the plant were studied.

Written by Dashzeveg Nyambayar

Iris koreana Nakai

Iridaceae

朝鲜鸢尾

노랑붓꽃

The morphology of *Iris koreana* somewhat assembles to *I. minutoaurea* Makino, but is distinct in having the following characteristics: longer length and 2–3 times wider widths of leaves, (usually) two flowers (Nakai, 1914). *Iris* L. comprises about 225 species in the temperate regions of the Northern hemisphere (Komarov, 1935; Zhao et al., 2000), including 13 species in Korea (Sim, 2007). Both Korean endemic *I. koreana* and Northeastern Asian *I. minutoaurea* occur in high elevation and belong to ser. Chinenses (Zhao et al., 2000). The molecular data supported the monophyly of ser. Chineses and the sister relationship of the two species, *I. koreana* and *I. minutoaurea* (Wilson, 2009). The high elevation distribution and close relationship to the Northeast Asian distribution suggest that the Korean endemic species, *Iris koreana*, might have derived from northern (boreal) floristic components.

Written by Gyu Young Chung & Kyong Sook Chung

Description

Herbs perennial, 20 cm tall. Rhizomes slender-shaped. Leaves 3–4, linear, 35 cm long, 1.3 cm wide, with 10–14 nerves. Cauline leaves short, veined. Flowers 1–2, yellow, 2.0–2.5 cm long, split into outer perianth and inner perianth. Sepals yellow, obovate. Petals elliptic marginalized, erected. Pistils curved. Ovary oblong, spindle-shaped. Capsules round-shaped. Fl. Apr, fr. Jun.

Distribution

Endemic to Korean Peninsula [Gyeongsangbuk-do, Jeollabuk-do, Jellanam-do]

Isoetes taiwanensis DeVol

Isoetaceae

- 台湾水韭
- 臺灣水韭

Description

Herbs perennial, aquatic. Rhizomes corm-like, 3–4-lobed, numerous dichotomously branching roots, a tuft of elongated grass-like leaves. Leaves widely spreading, 7–24 cm long, in tufts of 15–90 or more, flattened on the upper side, round on the lower side, base expanded with membranaceous margin, with scattered stomata near the tips; ligules elongate, triangular, velum rudimentary. Megaspores 250–300 μm in diam., microspores ca. 30 μm.

Distribution

Endemic to Taiwan Islands [natural population only found in a small lake, area ca. 2,800 m²]

©Yao-Moan Huang

The Dream Lake, in Yangmingshan National Park, north Taiwan, is an ecological conservation area for the aquatic Taiwan quillwort (*I. taiwanensis*). The survival and regeneration of the natural population are strongly associated with the water level. The water in the Dream Lake has often been insufficient over the last decade, resulting in the habitat being seriously invaded by other terrestrial plants and subsequent terrestrialisation. Indeed, the population was reduced to only two plants in early 2006. After removing the terrestrial plants, many spores immersed in the soil began to germinate and produce new sporophytes, and it is estimated that there are more than 20,000 mature plants in Dream Lake. In addition to the suitable removal of competing plants, maintenance of the water level enhances the growth of Taiwan quillwort, and some cultured plants are also transplanted to other nearby wetlands for *ex situ* conservation.

Written by Yao-Moan Huang

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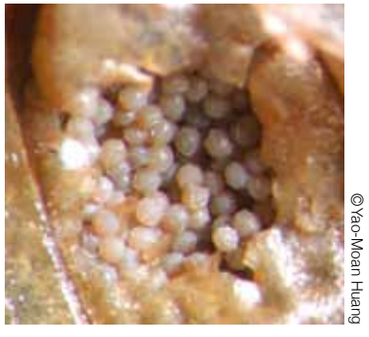
Isoetes taiwanensis and *I. yunguiensis* Wang Q. F. & W. C. Taylor are assumed to be the parents of *I. sinensis* Palmer based on molecular, cytological, and spore morphological data (Taylor et al., 2004). However, because the two former species are very rare and separated by a great distance, the possibility of hybridization requires further analysis. One variety, *Isoetes taiwanesis* DeVol var. *kinmenensis* FY Lu, HH Chen & YL Hsuen, is only found in a very small locality in Kinmen, an island near southeastern China (Lu, 2011).



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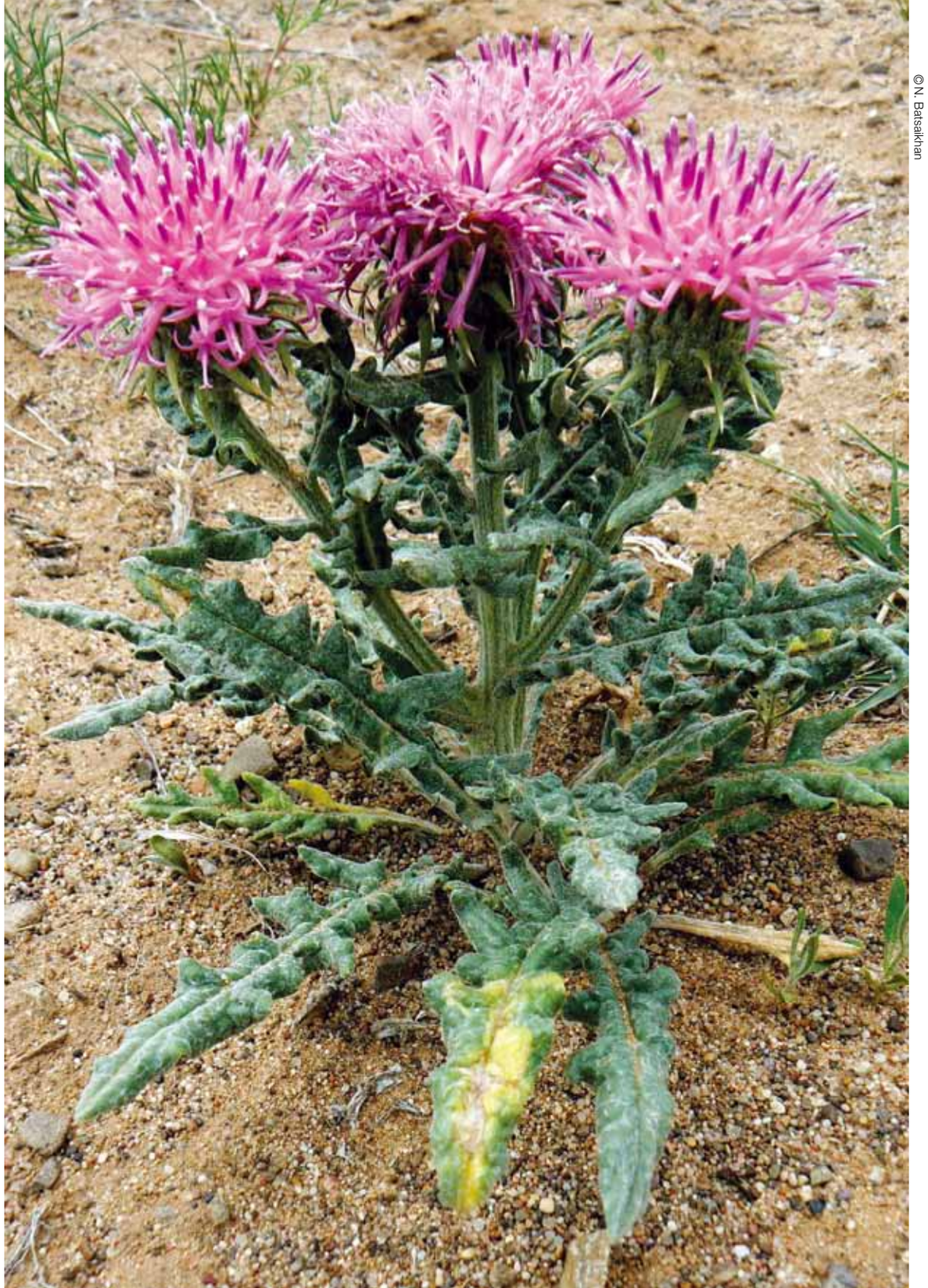
Jurinea mongolica Maxim.

Asteraceae

蒙疆苓菊

Монгол чоногоно

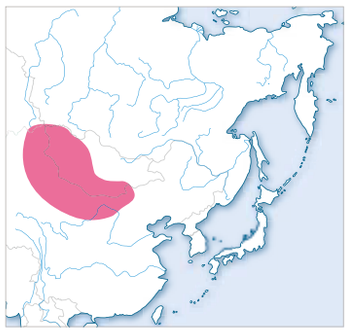


Description

Herbs perennial, 6–25 cm tall. Stems erect, stout, branched, apically covered with remains of petioles, densely white lanate. Basal leaves lanate, elliptic to narrowly ovate-elliptic, ca. 4 cm long, pinnately lobed, green to grayish green, margin entire and revolute. Cauline leaves sessile. Capitulum solitary. Involucre bowl-shaped, ca. 1.5 cm in diam.; phyllaries in 4–6 rows, leathery. Corolla rose-red, 2.0–2.5 cm, gland-dotted. Achenes brown, obconic; pappus dirty white.

Distribution

Mongolia, Mainland China



This species occurs in a very limited habitat range and has a restricted geographical distribution. Overgrazing of livestock and mining may threaten this species.

Written by Dashzeveg Nyambayar

Kandelia obovata Sheue, H. Y. Liu & J. Yong

Rhizophoraceae

- 秋茄树
- メヒルギ
- 水筆仔

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Description

Small trees or shrubs evergreen, 7 m tall. Stems thickened at the base. Bark gray to brown, smooth. Leaves elliptic, oblong, or obovate-oblong, 4–13 × 2–5 cm; stipules linear, 2–3 cm; petioles 1–1.8 cm. Inflorescences axillary, 6–9 flowered; pedicels 2–3 mm long, bracteoles 2–4, connate. Calyx cream, 1.5 cm long, deeply 5 (or 6)-linear-lobed. Petals inserted at the base of the disk, 5 (or 6), white, 1–1.5 cm, 2-lobed. Stamens many (up to 55). Fruits ovoid, 1.5–2.5 x 1.0 cm. Seeds 1, viviparous. Fl. Jun-Jul.

Distribution

Growing in margins of mangrove swamps and muddy or sandy tidal flats: Mainland China [southern regions], Japanese Archipelago [southern islands], Taiwan Islands, Vietnam

© Rempei Suwa

The genus *Kandelia* is distributed in tropical or subtropical coastal swamps in the Northwestern Pacific to India. Until 2003, it was recognized as a monotypic genus composed of *K. candel*. Sheue et al. (2003) found morphological, ecological, cytological and genetic differences between species, and divided them into two species; namely, *K. candel s. str*. in Borneo, Southeast Asia to west India and *K. obovata* as described here.

The unique ecology of the mangrove is noteworthy. Specifically, it has high tolerance of salt, low oxygen conditions and moving tide, viviparous seed and a strategy of survival and migration. Mangrove forests play important roles in maintenance of the unique ecosystems of swamps and supply interchange sites for migrating birds. Mangrove swamps tend to disappear owing to development and harvesting for firewood. Indeed, mangrove swamps have decreased by 29% since 1980 (FAO, 2007). Since propagation is easy, recovery is applicable in areas in which the habitat is maintained.

Written by Takayuki Kawahara

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Machilus thunbergii Siebold & Zucc.

Lauraceae

- 红楠
- タブノキ
- 후박나무
- 紅楠, 豬腳楠

Description

Trees evergreen, large, 15–20 m tall, 80–100 cm in diam. Bark yellow-brown. Leaves coriaceous, obovate, elliptic or broadly oblanceolate, 8–15 cm long, 3–7 cm wide, lustrous and deep green above, penninerved, pale green, slightly raised veinlets beneath; petioles 2–3 cm long. Flowers pedicelled; perianth-segments 6, narrowly oblong, 5–7 mm long, brown-pubescent inside. Drupes globose, ca. 1 cm wide, black-purple. Fl. Mar–May.

Distribution

Mainland China [Anhui, Fujian, Guangdong, Guangxi, Hunan, Jiangsu, Jiangxi, Shandong, Zhejiang], Korean Peninsula [Gyeonggi-do, Gyeongsangbuk-do, Gyeongsangnam-do, Jeollanam-do, Jeju-do], Japanese Archipelago [Honshu, Shikoku, Kyushu], Taiwan lslands

Machilus thunbergii is one of the species that forms northern range limits of evergreen broad-leaved forests in East Asia. Species forming limits of the northern range and the upper range are not consistent in Korea and Japan. The subgenus *Cyclobalanopsis* including *Q. acuta* dominates in upper range limits of the warm-temperate zone. This discrepancy in range limits is explained by the species interaction through species-specific responses to the sea wind at northern range regions (Hattori, 1992). Species distribution models incorporating future climate scenarios predicted that the potential habitats of *M. thunbergii* would expand northward and upward to the cool temperate zone (Yun et al., 2014). The species could be an indicator useful for monitoring of climate change impact.

Written by Katsuhiro Nakao

Mankyua chejuensis B. Y. Sun, M. H. Kim & C. H. Kim

Ophioglossaceae

제주고사리삼

©Hyung Ho Yang

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Description

Ferns perennial, 10–12 cm tall. Rhizomes dark brown, 1–2 cm long, creeping horizontally. Common stalk 8–12 cm long, greenish, fleshy, glabrous. Trophophore stalks 0.3–0.5 mm long, 6 cm wide, ternately divided, glabrous. Central lobe ovate to lanceolate, apex round to acute, base attenuate. Two lateral lobes usually further divided into two segments, ovate to lanceolate, veins free. Sporophores spikelike, arising from the top of a common stalk, a short stalk less than 1 mm long; spike small, linear, cylindrical, simple. Sporangia sunken in fleshy sporophore, 10–20 per row.

Distribution

Endemic to Korean Peninsula
[Jeju-do Island]

Mankyua chejuensis (Adder's-tongue family, Ophioglossaceae, s.l.) grows in marshes at around 200 m in evergreen broad-leaved forests on Jeju-do Island, a volcanic island located in the southern ocean (Moon, 2007; Sun et al., 2009). Only several habitats of the fern have been found, Seonheulri, Gimnyongri, and Dongbokri in Jocheoneup (Kim, 2007). The Korea Ministry of Environment categorizes the plant as II degree critically Endangered Species because of its small population and native habitat losses.

Ophioglossaceae, s.l. is traditionally divided into three genera, *Ophioglossum* L., *Botrychium* Sw., and *Helminthostachys* Kaulf. (Clausen, 1938; Wagner, 1990). The Korean endemic species, *Mankyua chejuensis*, shows increased generic diversity in the family (Sun et al., 2001). The genera in the family occur worldwide from low to high elevations. In addition, they are found in various ecological regions from early to ecological succession climax regions. They are primarily found in forests in middle ecological succession areas and forest roads and meadows in climax forests, but are also found in ecologically disturbed areas (Wagner, 1990).

It is unclear when *M. chejuensis* originated and settled in Jeju-do Island, but the age estimation of rocks from native habitats provides some clues. The native habitats in eastern Jeju-do Island consist of Basalt and Trachyte rocks formed between the first eruption period (120–70 million years ago) and the second eruption period (60–37 million years ago). These areas were free from trachyte lava flows formed during the third eruption (27–16 million years ago), which covered almost the entire island. The current habitats of *M. chejuensis* were formed during at least the late second eruption period or the volcano break (37–27 million years ago) before the third eruption. *M. chejuensis* might be descendants of the taxa dispersed northeast in the uplift lands (above the ocean) in southeastern areas during the late Cenozoic quaternary.

Written by Gyu Young Chung & Kyong Sook Chung

Megaleranthis saniculifolia Ohwi

Ranunculaceae

▪
모데미풀

Megaleranthis Ohwi is a monotypic, endemic genus to Korea. The type specimen, *Megaleranthis saniculifolia* Ohwi, was collected from Mt. Jirisan in southwestern Korea (Ohwi, 1937). *M. saniculifolia* occurs along the high elevation areas of Mt. Seoraksan, Mt. Sobaeksan, and Mt. Deogyusan, including in Baekdudaegan, as well in Mt. Hallasan (700–1,400 m), usually in mountain ridges, valleys and shady, moist, deciduous fore sts (Im, 1996; Park and Lee, 2007; Jang et al., 2009). *Megaleranthis* is closely related to *Trollius* L., with ca. 30 species distributed in the temperate and boreal areas of the Northern hemisphere. Additionally, two species occurring in Korea, *T. ledebourii* Rchb. and *T. chinensis* Bunge, are also found in northeastern China and Russian Far East (Park and Lee, 2007). The generic delimitations of the two genera are unclear, and some botanists have suggested merging the two genera (Kim and Lee, 1987; Lee, 1990; Heo and Suh, 2008). Further investigations using diverse applications are required to resolve taxonomic controversy over the genera.

Written by Gyu Young Chung & Kyong Sook Chung

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Description

Herbs perennial, 20–40 cm tall. Radical leaves divided into three sections; leaflets 2–3 divided, petiolules short. Cauline leaves absent. Flowers white, bracts similar to leaves in shapes and sizes, only one flower on a peduncle from the center of stem. Caylx 5-lobed, elliptic to obovate, petaloid, white. Corolla 8, yellow. Pistils 6–12. Stamens numerous, transitory. Follicles senescent; styles present, actinomorphic arrangement. Fl. May, fr. Jul.

Distribution

Endemic to Korean Peninsula [Gangwon-do, Chungcheongbuk-do, Gyeongsangbuk-do, Jeollabuk-do, Jeju-do]

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Metasequoia glyptostroboides Hu & W. C. Cheng

Taxodiaceae

- 水杉
- 메타세콰이아

Description

Trees deciduous, 50 m tall; crown narrowly conical or pyramidal, finally broadly conical. Leaves bluish green or yellowish green adaxially, paler abaxially, turning orange or red in autumn, linear, 0.8–1.5 cm long, 1.2–2.0 mm wide. Staminate strobili ovoid; bracts triangular-ovate or obovate, lowest minutely ciliate distally, others glabrous. Basal cone scales 9-ovulate, middle 7-ovulate, distal 5-ovulate, apical sterile. Seeds ca. 5 × 4 mm.

Distribution

Endemic to Mainland China [Sichuan (Shizhu), Hubei (Lichuan), Hunan (Longshan, Shuangzhi)]

This tree was the most widespread species in the Northern hemisphere during the Tertiary period. Fossils have been found across the Northern hemisphere, including in Greenland and Norway, dating from when the continents were further south, and close together sharing a common flora. In 1941, Miki reclassified fossil remains that had been incorrectly classified as *Sequoia* and *Taxodium*, at which time he named the tree species *Metasequoia* due to its resemblance to the North American redwood (*Sequoia sempervirens*). In late autumn of 1947, Kan of Beijing National Central University found three deciduous trees he had never seen before. During a subsequent expedition, many more of the same trees were found remote area in southwest China. In 1948, it was discovered that the species belonged to the already described fossil genus *Metasequoia*. Professor Hu Xiansu (1894–1968) is credited with making this important connection, and providing the specific epithet “glyptostroboides”, after its resemblance to the Chinese swamp cypress (*Glyptostrobus*).

In an effort to protect the tree species from logging, it was immediately planted in arboreta worldwide. In China, the species is rare because the valley floors are largely under rice cultivation. Riparian habitats are on valley floors and in moist ravine bottoms, on acidic, montane yellow-earth soils in regions with moderate climates.

Written by Hongwen Huang

Michelia odora (Chun) Noot. & B. L. Chen

Magnoliaceae

观光木

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Description

Trees evergreen, 25 m tall. New twigs, buds, petioles, leaf blades abaxilly and pedicels densely yellowish brown strigose. Leaves obovate-elliptic, 8–17 cm long, 3.5–7.0 cm wide; petioles 1.2–2.5 cm long. Flowers fragrant, tepals 9, ivory-yellow and red-dotted, narrowly obovate-elliptic, 3-whorled, outer ones largest, 1.7–2.0 cm long and about 7 mm wide. Stamens 30–45; filaments white or light reddish; gynoecia 9–13. Fruits aggregated follicles, elongate-ellipsoid, 10–18 cm long, 7–9 cm in diam. Seeds 1–12 per carpel. Fl. Mar–Apr, fr. Oct–Dec.

Distribution

Mainland China [Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Yunnan], northern Vietnam

Michelia odora is an evergreen tree that belongs to the family Magnoliaceae. The tree has fragrant flowers subject to insect pollination that results in low rates and large seeds. The tree was originally named *Tsoongiodendron odorum* Chun in memory of Mr. Zhong Guanguang, who is one of the modern botany advocates in China. *Michelia odora* is a relict plant in Mesozoic Cretaceous distributed in southeast Yunnan and Guangxi, Guangdong, Jiangxi, Hainan and Fujian in China (Liu, 1984), as well as northern Vietnam. The tree is found at an altitude of 300–1,100 m in green broad-leaved forests. Although it is widely distributed, it has very small wild populations, many of which contain only one or a few plants. At present, the wild population and population size are still in decline. Accordingly, it has been listed as a near threatened species by the World Conservation Union (IUCN), and as a second class national key protected plant in China. It is valued for its timber and as an ornamental plant.

Written by Hongwen Huang

Microbiota decussata Kom.

Cupressaceae

- 시베리아눈측백
- Микробиота перекрестнопарная

Endemic genus to Sikhote-Alin Mountain Range in the northern part of the Sino-Japanese floristic region (the Russian Far East). *Microbiota decussata* was first discovered in 1921, and has been widely distributed in botanic gardens in temperate regions worldwide since the 1960s. In nature, it occupies open spaces on rock fields of mountains at 500–1,600 m above sea level, where it forms pure monodominant thickets. The overall distribution of the species is sporadic, and it is included in the red list of Russia. The microfossils of *Microbiota* were found in Jurassic deposits and also well represented in the late Eocene – late Oligocene deposits. Morphologically and genetically, this species is close to *Platycladus orientalis*, but it has more primitive features in generative organs and wood anatomy. Studies of vegetation history suggests that *Microbiota* was widely distributed in the Sikhote-Alin mountains in the Pliocene and survived the LGM in mountain refugia. Written by Pavel V. Krestov

Description

Shrubs coniferous, 80 cm tall. Stems prostrate, 2–5 m long. Leaves flat, scale-like, 2–4 mm long. Cones smallest among any conifer, 2–3 mm long, green to brown when ripening in about 8 months from pollination, 4 scales arranged in two opposite pairs. Seeds 2 mm long, no wing, 1–2 seeds in each cone.

Distribution

Endemic to Russian Far East [Sikhote-Alin mountain range]

Morus boninensis Koidz.

Moraceae

- 小笠原桑
- オガサワラグワ
- 오가사와라뽕나무

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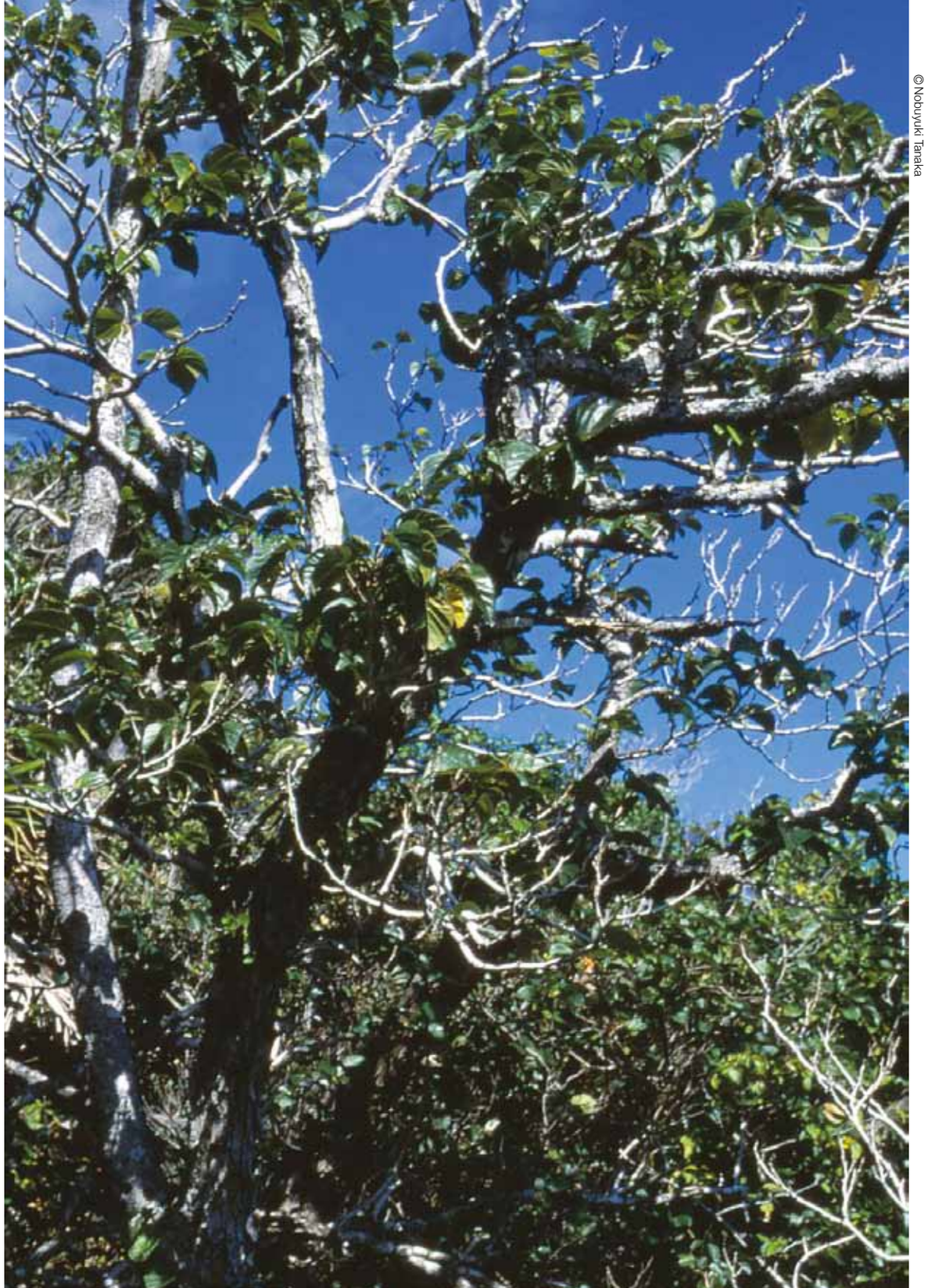
Description

Trees deciduous, 20 m tall, more than 1 m across. Bark scaly, brownish gray. Leaves alternate, thick, chartaceous, serrate, oval, 8–25 cm long, 6–20 cm wide, apex shortly acuminate, not dissected; petioles 2–9 cm long. Male aments pendulous; flowers 4-merous, short stalked or sessile. Female inflorescences cylindrical, 1–2 cm long; peduncles 1–2 cm long, hairy. Styles almost free. Infructescences purplish black in mature trees.

Distribution

Endemic to Japanese Archipelago [Ogasawara Islands]



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The Ogasawara Islands are situated 1,000 km south of Tokyo. Because the islands have never been connected to the Japanese mainland, unique biota have formed. Approximately 50% of the plant species are endemic. Until 150 years ago, almost no residents lived on the islands; therefore, the biodiversity was well conserved until recently. As a result, the Ogasawara Islands have been nominated as a natural world heritage site. The endemic species, *Morus boninensis*, has been shown to be the most ancestral in the genus *Morus* by molecular phylogeny.

Currently, there are only 150 *M. boninensis* trees, including planted ones. The threats to the species are past excessive logging, herbivory by introduced animals such as goats, competition with fast growing introduced trees such as *Bischofia javanica*, and hybridization with introduced mulberry, *Morus bombycis*, as food for silk worms. The wood of the species was popular as furniture because of its hard and heavy quality and glassy, black characteristics. A recovery program was recently started using micropropagation technology.

Written by Takayuki Kawahara

Myricaria laxiflora (Franch.) P. Y. Zhang & Y. J. Zhang

Tamaricaceae

疏花水柏枝

Myricaria laxiflora occurs entirely in the low altitude region of the Yangtze River valley with a reversed seasonal growth habit of summer dormancy and winter growth. The species normally undergoes summer dormancy when the water level rises from May to October. Most natural populations of *M. laxiflora* were submerged when the Three Gorges Dam (TGD) was completed in 2009. *Myricaria laxiflora* has become endangered in the wild owing to construction of the Three Gorges Dam (TGD) in the Yangtze River Valley, and has been listed as endangered on the China Species Red List. During the past ten years, many field surveys and collections have been conducted and most individual plants representing the main natural populations of *M. laxiflora* have been collected and placed in an extensive collection of natural populations in a specialized ex situ conservation section at Wuhan Botanical Garden. Two satellite *ex situ* conservation sites have also been established locally in Lanling Brook and Si Brook, which are both branches of the Yangtze River located close to the natural range of *M. laxiflora* in Zigui county. Written by Hongwen Huang

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Description

Shrubs evergreen, 1.5 m tall. Stems erect. Branches green or red-brown, old branches red-brown or purple brown. Leaves lanceolate or oblong, 2–4 mm long, 0.8–1.0 mm wide. Racemes usually terminal, 6–12 cm long; bracts lanceolate or ovate-lanceolate, ca. 4.0 x 1.5 mm. Sepals lanceolate or oblong. Petals pink or purplish, obovate, 5–6 × ca. 2 mm. Capsules narrowly conic, 6–8 mm long. Seeds 1.0–1.5 mm, apex awned. Fl. and fr. Jun-Aug.

Distribution

Endemic to Mainland China [The water level fluctuation zone in 12 counties from Chongqing to Yichang, altitudinal range 70–155 m above sea level along the Yangtze River valley]

Olgaea leucophylla (Turcz.) Iljin

Asteraceae

- 火媒草
- Цагаан навчит хасзул

Distribution

Mongolia [Middle Khalkh, Eastern Mongolia (Ongon Els), Valley of Lakes (Tui river), Eastern Gobi (60 km to the south of Manlai district of Umnugovi province), Gobi-Altai (Zuulun Mountain)], Mainland China

The genus *Olgaea* comprising about 16 species mostly distributed in Central Asia. Among those species, *Olgaea leucophylla* is native to China and Mongolia, grows in the grasslands and farmlands.

Written by Magsar Urgamal

Description

Herbs 15–80 cm tall. Stems grayish white, erect, branched from base or unbranched, stout, densely cobwebby-felted; wings wide, parchment-like, spiny, toothed, or lobed. Leaves grayish white, subconcolorous, abaxially cobwebby-felted, adaxially ± densely cobwebby; basal leaves with thick densely felted petiole, narrowly elliptic, 12–20 × 3–5 cm, parchment-like, shallowly pinnately lobed or toothed; segments or teeth 7–10 pairs, triangular to semiorbicular, with lateral spines and a brown to yellowish 5–6 (–10) mm apical spine; middle cauline leaves elliptic to elliptic-lanceolate, sometimes undivided; upper cauline leaves elliptic, lanceolate, or narrowly triangular. Capitula few to many; involucres campanulate, 3–4 cm in diam., glabrous or subglabrous; phyllaries distally narrowed into a spine; outer phyllaries triangular, 10–15 × 2.5–3.0 mm, recurved; middle phyllaries lanceolate to elliptic-lanceolate, 1.8–2.5 × ca. 0.3 cm; inner phyllaries linear-elliptic to broadly linear, 3.2–3.6 × ca. 0.2 cm. Corolla purple or white, ca. 3.3 cm, tube ca. 8 mm. Achenes yellowish variegated with brown, narrowly ellipsoid, ca. 1 cm, 10-ribbed; pappus bristles, pale brown, 2.5 cm. Fl. and fr. May–Oct.

Osmundastrum cinnamomeum (L.) C. Presl

Osmundaceae

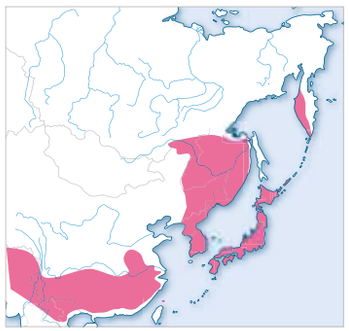
- 桂皮紫萁
- 꽝고비
- 假紫萁

Description

Ferns summer-green. Rhizomes creeping or ascending, short. Fronds dimorphic, young fronds densely covered with long lax hairs, glabrescent and nearly naked when mature. Fertile and sterile fronds about the same length, 60–100 cm long. Sterile fronds bipinnatifid, fertile fronds usually developing earlier than the sterile fronds. Pinnae sessile, incised almost to costa. Sporangia not assembled in sori, strongly contracted fertile segments. Sporangia opening by an apical slit. Spores green.

Distribution

Russian Far East, Mainland China [southern regions], Korean Peninsula, Japanese Archipelago, Taiwan Islands [a few northeastern wetlands], Myanmar, Thailand, Vietnam, America



Osmundaceae originated on the Gondwana continent of the Southern Hemisphere during the Permian (Gould, 1970), spreading to the Northern Hemisphere through Asia and South America, and arriving in Europe and North America by the late Triassic (Skog, 2001). Therefore, many living species with widely disjunct distributions are found, including *Osmundastrum cinnamomea* (e.g., Hewitson, 1962; Yatabe et al., 1999). This species has undergone little or no anatomical change since the Cretaceous, which implies a minimum age of 70 million years for the species; accordingly, it is considered a "living fossil" (Serbet and Rothwell, 1999). Although it is widely distributed in Asia and America, in Taiwan it is only found in a few northeastern wetlands, with small populations in each locality, and it is evaluated as a local vulnerable species (Wang et al., 2012). The suitable spore culture has been demonstrated to successfully produce sporelings and to be useful for *ex situ* conservation of this species (Huang et al., 2004).

Written by Yao-Moan Huang

This species has traditionally been classified as *Osmunda cinnamomea* L. However, recent molecular evidence demonstrates that this species is a sister to the rest of the living Osmundaceae, and therefore segregated to the genus *Osmundastrum*. Nucleotide data further indicate that within-species variation of *O. cinnamomeum* between New World and Asian individuals may represent distinct taxa (Metzgar et al., 2008).

Pachylarnax sinica (Y. W. Law) N. H. Xia & C. Y. Wu

Magnoliaceae

华盖木

Description

Trees evergreen, large, 40 m tall, 1.2 m in diam. Leaves leathery, narrow obovate or obovate-elliptic, 15–26 (30) cm long, 5–8 (9.5) cm wide, deep green and glossy adaxially, pale green abaxially; petioles 1.5–2.0 cm long. Flowers solitary terminal. Tepals 9, 3-whorled, outer ones oblong-spatulate, middle and inner ones obovate-spatulate and smaller. Stamens about 65. Gynoecia long ovoid. Carpels 13–16. Fruits aggregative follicles, obovoid or elliptic-ovoid, 58.5 cm long, 3.5–6.5 cm in diam. Follicles woody. Seeds 1–3 per follicle. Fl. Apr, fr. Sep–Nov.

Distribution

Endemic to Mainland China [Yunnan (Xichou, Maguan, Jinping, Pingbian)]

Pachylarnax sinica has been treated as a unique species of the monotypic genus, *Manglietia strum*, by Law Yuwu in 1979. Nooteboom (1985) recombined it with *Magnolia sinica*, while Baoling and Nooteboom (1993) combined it with *Manglietia sinica* Xia Nianhe and Wu (2008) finally treated it as the current name. This species occurs in highly fragmented and isolated habitats with five minimal sized populations of 5, 6, 7, 10 and 20 individuals in four counties in southeast Yunnan province, Xichou, Maguan, Jinping and Pinbian. The tree grows in evergreen broad-leaved forests at 1,300–1,600 m above sea level.

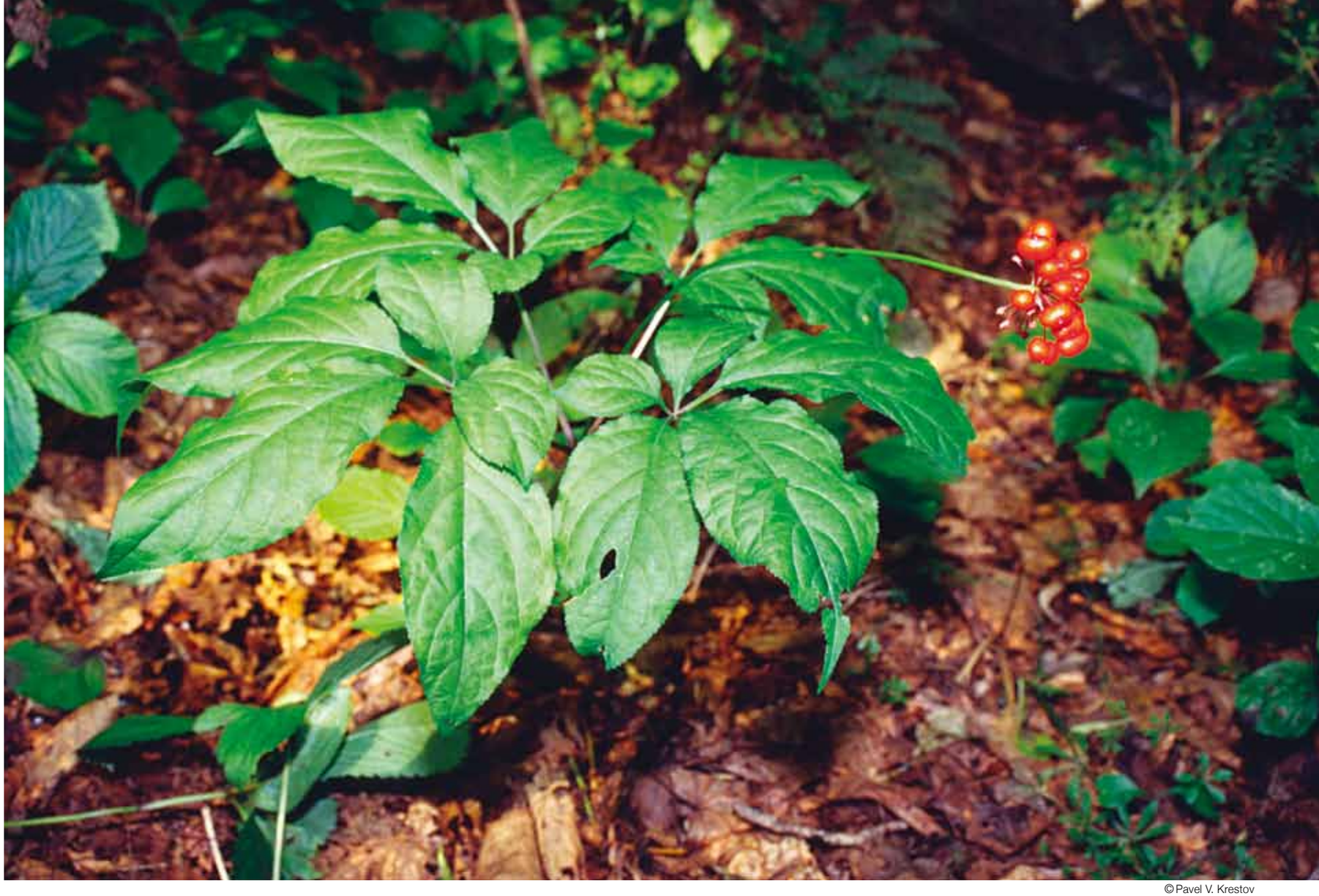
It is estimated that there are less than 50 plants in total. The species is threatened by cutting, habitat destruction and poor natural regeneration, and has been identified as one of the most endangered magnolia species in the world. IUCN assessed it as critically endangered on the basis of its very small population size, and it has also been listed as endangered in the China Plant Red Data Book and categorized as a species in need of first grade protection since 1999 in China. Key maternal trees are well protected with the assistance of local government agencies and nature reserves. There are also three *ex situ* collections in the world and a number of saplings have been planted to supplement the wild population.

Written by Hongwen Huang

Panax ginseng C. A. Mey.

Araliaceae

- 人参
- 인삼
- Женьшень



© Pavel V. Krestov

Description

Herbs perennial, 25–60 cm tall. Roots massive cylindric, usually with 1- or 2-fascicled roots. Leaves palmately compound, verticillate at the stem top, with 3–5 membranous; petioles long; leaflets glabrous abaxially, sparsely setose adaxially. Inflorescences solitary, terminal umbel, 20–40-flowered, greenish. Flowers bisexual, calyx lobes 5, petals 5, stamens 5. Fruits berries, red, compressed-globose, 4–5 × 6–7 mm. Seeds nephroid, white.

Distribution

Russian Far East, Mainland China [northeastern regions], Korean Peninsula [all provinces]

Panax ginseng is a typical representative of the Tertiary floristic complex that is closely connected to the ecosystems of the broad-leaved and Korean pine forests, where it forms very sparse populations or grows as single plants. It is a long-leaving species that may have long periods (several growing seasons) of dormancy under unfavorable conditions. Ginseng is well known for its pharmaceutical properties and widely used in traditional and official medicines in different countries. Owing to its high value, nearly all natural populations of ginseng have been destroyed or eliminated. Intact populations can be still found in the northern part of its range, in intact forests of the Russian Far East. It is the most threatened species among the East Asian flora, practically extinct from its natural habitats due to anthropogenic impact. Urgent efforts for ginseng conservation should be applied as soon as possible.

Written by Pavel V. Krestov

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Paphiopedilum armeniacum S. C. Chen & F. Y. Liu

Orchidaceae

杏黄兜兰

Description

Herbs terrestrial or lithophytic, with 1 to several rhizomes. Leaves 5–7, distichous, oblong or linear-oblong, 6–12 cm long, 18–23 mm wide, thickly leathery, abaxially densely purple spotted and carinate, adaxially tessellated with dark, light green, margin serrulate. Scapes 15–28 cm long, brown-pubescent. Flowers solitary, 7–9 cm in diam., pale yellow to golden yellow, sometimes slightly flushed with pale green. Lips subglobose or somewhat flattened globose. Fl. Feb–Apr.

Distribution

Mainland China [W Yunnan (Bijiang, Lushui)], northern Myanmar

Paphiopedilum armeniacum is a rare and endangered species endemic to China. It blooms from late fall to early spring with one yellow flower per inflorescence and is a highly valued slipper orchid species commonly known as Golden Slipper Orchid in the ornamental market. *P. armeniacum* is very closely related to *P. micranthum* Tang & Wang, but with apricot yellow flowers rather than pink-white flowers of *P. micranthum*. These two slipper orchids are highly marketed as “golden couple” in the orchid industry. The plant has a very narrow distribution, confined to Bijiang and Lushui, in western Yunnan province. It has niche habitats, normally occurs at 1,400–2,100 m above sea level and on limestone cliffs and well-drained rocky slopes, where it is subjected to constant light fog in the winter and heavy rain in the summer. A few populations are found in relatively restricted areas, usually with small population sizes. *P. armeniacum* reproduces well in the wild, and is tolerant of poor soil conditions in its niche habitat. *P. armeniacum* is listed as endangered in the IUCN red list. The current endangered status of *P. armeniacum* is mostly a result of overharvesting for the illegal orchid industry owing to its high prices.

Written by Hongwen Huang

Pentarhizidium orientalis (Hook.) Hayata

Onocleaceae

- 东方荚果蕨
- 개면마
- 東方荚果蕨

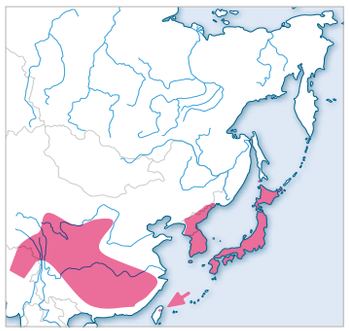
©Yao-Moan Huang

Description

Ferns summer-green. Rhizomes robust, shortly creeping, apex ascending, covered with brown scales. Sterile fronds bipinnatifid, ovate-deltoid; pinnae 15–20 pairs, stipe brown, base swollen, triangular, bearing short pneumatophores. Fertile fronds as long as or shorter than sterile fronds, pinnate, ellipitic; pinnae oblique, close, dark purple, linear, hardened. Sori fused into linear coenosori when mature, enclosed by reflexed laminar margins. Indusia membranous, fixed at the posterior end, free distally. Spores green with brown perine, easily peel off.

Distribution

Russian Far East [Moneron Island, Kunashir Island], Mainland China, Korean Peninsula, Japanese Archipelago, Taiwan Islands, India [Himalayas]



Although *Pentarhizidium orientalis* is a widely distributed and common fern in temperate Asia, the population in Taiwan is at the southeastern edge of its distribution range with only a few locations that each contain < 100 individuals; accordingly, it is considered a critically endangered species based on IUCN categories and criteria (Wang et al., 2012). The *ex situ* conservation can be achieved by spore culturing (Huang et al., 2011). A previous study revealed that it is diploid (2N = 80) and produces sporophytes sexually. Its fresh spores show 100% germination under suitable growth conditions, but the germination rate declines to 28.2% for those spores stored for 15 weeks at 4°C (Huang et al., 2011). Further exploration is required to develop a more effective method to retain spore viability in terms of the conservation of this species. Owing to isolation of Taiwanese populations, genetic differentiation among species should also be investigated.

Written by Yao-Moan Huang

Two Asian species in this genus, *Pentarhizidium orientale* and *P. intermedium* (C. Chr.) Hayata. A form "*P. orientalis* f. *monstra* Ching & K. H. Shing" were described from Hubei, China.

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Phellodendron amurense Rupr.

Rutaceae

- 黄檗
- キハダ
- 황벽나무
- бархат амурский

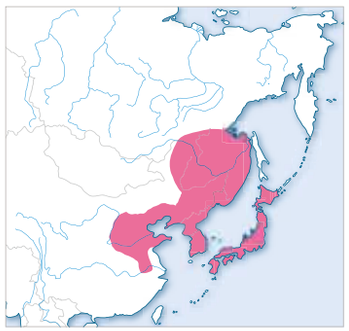
© Wei Cao

Description

Trees deciduous, 10–30 m tall. Stems 1 m in diam. Leaves opposite, pinnately compound; leaflets 7–13, entire, ovate to ovate-lanceolate, 6–12 × 2.5–4.5 cm. Inflorescences terminal, panicles, pedunculate. Dioecious. Flowers yellowish-green. Ovary 5 locules. Styles short, producing abundant clusters of fruits. Drupes globose, ca. 1 cm in diam. Seeds ca. 6 × 3 mm. Fl. May–Jun.

Distribution

European Russia, Russian Far East, Mainland China [northeastern, northwestern, central eastern regions], Korean Peninsula [all provinces], Central Asia



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Phellodendron amurense is a deciduous tree named for its thick corky bark, which is slightly spongy or corky at touch. The layer of inner bark that can be revealed with a quick scrape of a pocket-knife is distinctive bright yellow.

Phellodendron amurense grows on moist habitats but water logging. Its cold resistance is gradually enhanced to -40°C with increasing age. The tree is also used for its strong resistance to pollutants. Its inner bark can be made into medicine after processing. The tree contains a variety of alkaloids that are important raw materials used in the extraction of berberine. Its wild population is decreasing due to the increase in demand for medicines made from the tree and unreasonable use. In 1987, it was classified as a class II plant under state protection plan in China.

Written by Wei Cao

Phyllodoce aleutica (Spreng.) A. Heller

Ericaceae

- 松毛翠属
- アオノツガザクラ
- Филлодоце алеутская

© Vyacheslav Barkalov

Description

Shrubs evergreen, dwarf, 20–30 cm tall, long-lived (up to 50 years). Branches densely leafy, puberulent. Leaves small, linear, 8–14 mm long, bright green above, yellowish beneath. Flowers 1–10 on the top of twigs, campanulate, white or slightly greenish, pendulous. Calyx lobes broadly lanceolate, 4–5 mm long. Corolla urceolate, pale yellowish green, glabrous. Seeds many, ovoid. Flowering depends on the time of year. Fl. Apr–May in nature.

Distribution

Northern Pacific regions with oceanic climate: Russian Far East [Kamchatka, Sakhalin], Japanese Archipelago [Hokkaido], North America [Alaska, Aleutian Islands]

Phyllodoce aleutica forms dense vegetation communities around snow beds and in tundras of oceanic regions of northern Pacifica (Japanese Archipelago, Kuril Islands, eastern Kamchatka, Aleutian Islands, narrow strip of western North America along the Pacific coast). Such distribution is also characteristic of *Arnica unalascensis*, *Erigeron peregrinum*, *Parageum calthifolium* and other species. This species complex was formed under humid and cold climate conditions and survived Pleistocene aridization in the coastal refugia. The limited contemporary distribution of *Phyllodoce aleutica* suggests that this species occupies refugia at present and is sensitive to the current climate change. Similar history is characteristic of several boreal species, including *Arnica unalascensis*, *Erigeron peregrinum*, and *Parageum calthifolium*.

Written by Pavel V. Krestov

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Picea jezoensis (Siebold & Zucc.) Carrière

Pinaceae

- 鱼鳞云杉
- エゾマツ
- 가문비나무
- Ель аянская

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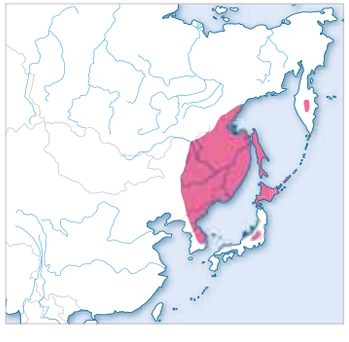
Description

Trees coniferous, evergreen, 20–40 (50) m tall. Stems erect, 1 m in diam., broad conic crown. Bark thin, scaly, becoming fissured in old trees. Needles 15–20 mm long, 2 mm wide, flattened in cross-section, dark green above with no stomata, blue-white below with two dense bands of stomata. Cones pendulous, cylindrical, 4–7 cm long, 2 cm wide; scales oblong, denticulate on upper margin. Seeds black, ca. 3 mm long, with a slender wing; seed wing pale brown, 6–8 mm long.

Distribution

Russian Far East [coast of the Sea of Okhotsk, Sikhote-Alin, central Kamchatka, Sakhalin], Mainland China [northeastern regions], Korean Peninsula [northern provinces, Gangwon-do, Jeollabuk-do, Gyeongsangnam-do], Japanese Archipelago [Hokkaido, central Honshu]



Yezo spruce is the main species forming the dark-conifer forests in maritime and oceanic regions in the boreal zone of Northeastern Asia. Owing to its high shade tolerance, spruce is less dependent on canopy gaps. Horizontal stand structure is commonly random, but because of dense moss cover, spruce may regenerate successfully on decomposing fallen logs and stumps that cause small patches within a stand. The lower tree layer contains suppressed or younger trees of spruce with a mix of Manchurian fir (*Abies nephrolepis*) and Sakhalin fir (*Abies sakhalinensis*). The trees form pure stands under conditions of cool summers, mild winters and precipitation over 1,500 mm, with half or more falling in winter. Humid fir-spruce forests of the Russian Far East are characterized by the presence of many representatives of Japanese flora, including the humidity-dependent species that survived severe Pleistocene cooling and aridization due to refugia capable of holding moisture. The species composition of spruce forests in maritime mainland areas are enriched by islanders rugose holly (*Ilex rugosa*), *Skimmia repens*, evergreen huckleberry (*Vaccinium ovatum*), and pubescent huckleberry (*V. hirtum*). Yezo Spruce is very closely related to Sitka Spruce (*Picea sitchensis*), which replaces it on the opposite side of the North Pacific. They can be difficult to distinguish, particularly subsp. *jezoensis*, with the absence of stomata on the upper surface of the leaves of *P. jezoensis* being the best distinguishing feature. Its leaves are also somewhat blunter and less sharply spine-tipped than Sitka Spruce. A similar history is characteristic of other boreal species, including *Abies nephrolepis* and *Abies sakhalinensis*.

Written by Pavel V. Krestov

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Pinus densiflora Siebold & Zucc.

Pinaceae

- 赤松
- 소나무

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Description

Trees coniferous, evergreen, 35 m tall. Bark red-brown, flaking and scaly. Leaves 2 per bundle, acicular, whorled, 8–9 (14) cm long, 1.5 mm wide, green. Monoecious. Staminate strobili elliptic, yellow, short branchlets, 5–8 mm long. Carpellate strobili ovate, light purple, 3.1–5.5 mm. Cones ovoid, brownish yellow, 26.2–56.0 mm long, 26.1–38.7 mm wide. Seeds elliptical, blackish brown, winged, 56 mm long, 3 mm wide, maturing in 2 years. Fl. May, fr. Sep–Oct.

Distribution

Russian Far East, Mainland China [E and S Heilongjiang, NE Jiangsu, SE Jilin, Liaoning, E and N Shandong], Korean Peninsula [all provinces], Japanese Archipelago

Pinus occurs broadly in Eurasia between 70° N (Norway) and 2° N (Sumatra), except for *P. merkusii*, which is found below equatorial regions. *Pinus* grows from near seashores to high mountains such as *P. walchiana* in Himalaya (ca. 4,000 m above sea level). In Korea, *P. densiflora* is found nationwide at 100 m to 1,300 m. Long wings on seeds, three times longer than seeds, have contributed to seed dispersal and subsequent broad distributions in the Korean Peninsula. *Pinus* originated in the early Cretaceous from the temperate regions of northern mid-latitudes (Richardson and Rundel, 1998; Millar, 1998). The genus adapted to dry and diurnal temperatures (high daily temperature fluctuations) from the early Cretaceous (Mirov, 1967; Axelrod, 1986). In the Tertiary period, *Pinus* was distributed to near 32° N (Mirov, 1967). The estimated time period of the *P. densiflora* fossils found in East China and Japan is the last Tertiary Eocene (Millar, 1993; 1998), and *P. thunbergii* Parl. was distributed in the refuge of middle Asian warm temperate areas during the Mid-Tertiary (Hiller, 1972). In the Korean Peninsula, *Pinus* appeared nationwide from the Cretaceous Tertiary Miocene to Quaternary Pleistocene-Holocene. Currently, the genus shows successful adaption to broad ranges of ecological areas in Korea, occurring from cold, northern high elevations to warm, southern areas along seashores.

Written by Gyu Young Chung & Kyong Sook Chung

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Pinus koraiensis Siebold & Zucc.

Pinaceae

- 红松
- チョウセンゴヨウ
- 잣나무
- Кедр корейский

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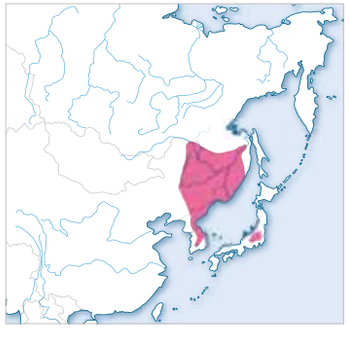
Description

Trees evergreen, 40–50 cm tall. Stems erect, 1.5–2.0 in diam. Needles 5 in fascicles, deep green, 7–13 cm long, with 2 stomatal bands on the inside. Cones ovoid-conical or oblong-conical, 8–17 cm long, 5–7 cm in diam., green or purple before maturity, ripening brown about 18 months after pollination; scales obtuse and slightly recurved at the apex. Seeds 14–18 mm long, with no wing, dispersed by birds and animals.

Distribution

Russian Far East [southern regions], Mainland China [northeastern regions], Korean Peninsula [Pyeonganbuk-do, Hamgyeongbuk-do, Hamgyeongnam-do, Gyeonggi-do, Gangwan-do], Japanese Archipelago [central Honshu]



The Korean pine forms the unique biome of the broad-leaved and Korean pine forests in the sub-maritime sector of the northern temperate subzone. It occurs in the Sikhote-Alin Mountains in Russian Far East and in northeast China, where it has a range of about 3 million hectares; however, in China, these forests were totally transformed. The mixed broad-leaved and Korean pine forests have very complicated canopy structures. The tree layer normally includes three sub-layers, formed by species of different growth forms and different life strategies. The dominants in the mixed-forest ecosystems have different growth forms and life strategies. Despite the high diversity in canopy species, the most important processes in this forest type are controlled by Korean pine, a long-living moderately shade-tolerant species. The seeds of Korean pine are an important source of energy for long food chains that start with small rodents highly specialized to feed on the pine seeds, as well as some large representatives of far eastern fauna, such as bears and wild boars. These forests, also known as 'Ussurian taiga', served as species-rich refugia during the Pleistocene ice-age and now include over 100 globally unique (endemic) species of plants and animals with origins dating back to the Tertiary boreo-nemoral biome (time between extinction of dinosaurs and beginning of the Pleistocene ice-age). Endemic species include the world's largest cat, the Amur tiger (*Panthera tigris atlaica*), an isolated and very small population of snow leopard (*Panthera pardus orientalis*) and the last wild population of the well known medicinal plant, ginseng (*Panax ginseng*), in the world. Other boreal species including *Vaccinium vitis-idaea* and *Empetrum nigrum* have similar histories.

Written by Pavel V. Kresto

Pinus pumila (Pall.) Regel

Pinaceae

- 偃松
- ハイマツ
- 눈잣나무
- Кедровый стланик

The Siberian dwarf-pine is one of the most unusual and interesting woody species in appearance and adaptation. The tree occurs widely in Northeastern Asia, forming a vertical vegetation belt in mountain systems, but as a zonal vegetation type it occurs across suboceanic sectors of the subarctic zone under hyperhumid climate conditions with heavy snow covering the ground almost eight months per year. The total area of the Siberian dwarf-pine is about 0.75 million hectares. The territory, in which *Pinus pumila* forms monodominant communities on zonal sites, stretches from approximately 60° N to 67° N within the intensively dissected mountainous terrain of northeasternmost Asia. The ecoform of the Siberian dwarf pine seems to not have an analog among other tree or shrub species. Adaptation to severe climatic conditions with deep snow cover results in a very specific crown architecture and seasonal dynamics. Many authors include the growth form of *Pinus pumila* in the class of dwarf trees. Under favorable conditions (well developed soil profile), *Pinus pumila* grows as a dwarf tree with one main stem lying on the ground and well-developed upwardly growing branches, elevated to about 6 m in the summer. In northern Sakhalin, the largest basal diameters measured were 32 cm, stem length 14 m, and branch height 4 m. On the Shantar Islands, the largest recorded basal diameter was 40 cm.

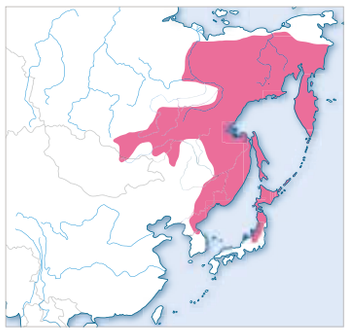
Written by Pavel V. Krestov

Description

Shrubs coniferous, evergreen, 5–6 m tall or prostrate. Branches long creeping, young shoots brown, pubescent. Stems lying on the ground, 12–15 m long. Needles 5 in fascicles, slightly incurved, 3–10 cm long. Cones subsessile, ovoid or ovoid-globose, 5–10 cm long, green or purple before maturity, ripening brown about 18 months after pollination, scales numerous, broad ovate. Seeds 6–8 mm long, with no wing, dispersed by birds and animals.

Distribution

Eastern Siberia, Russian Far East [Kamchatka], Korean Peninsula [northern provinces], Japanese Archipelago [Hokkaido, central Honshu], Europe, North America [California]



Pinus sylvestris var. *sylvestriformis* (Taken.) W. C. Cheng & C. D. Chu

Pinaceae

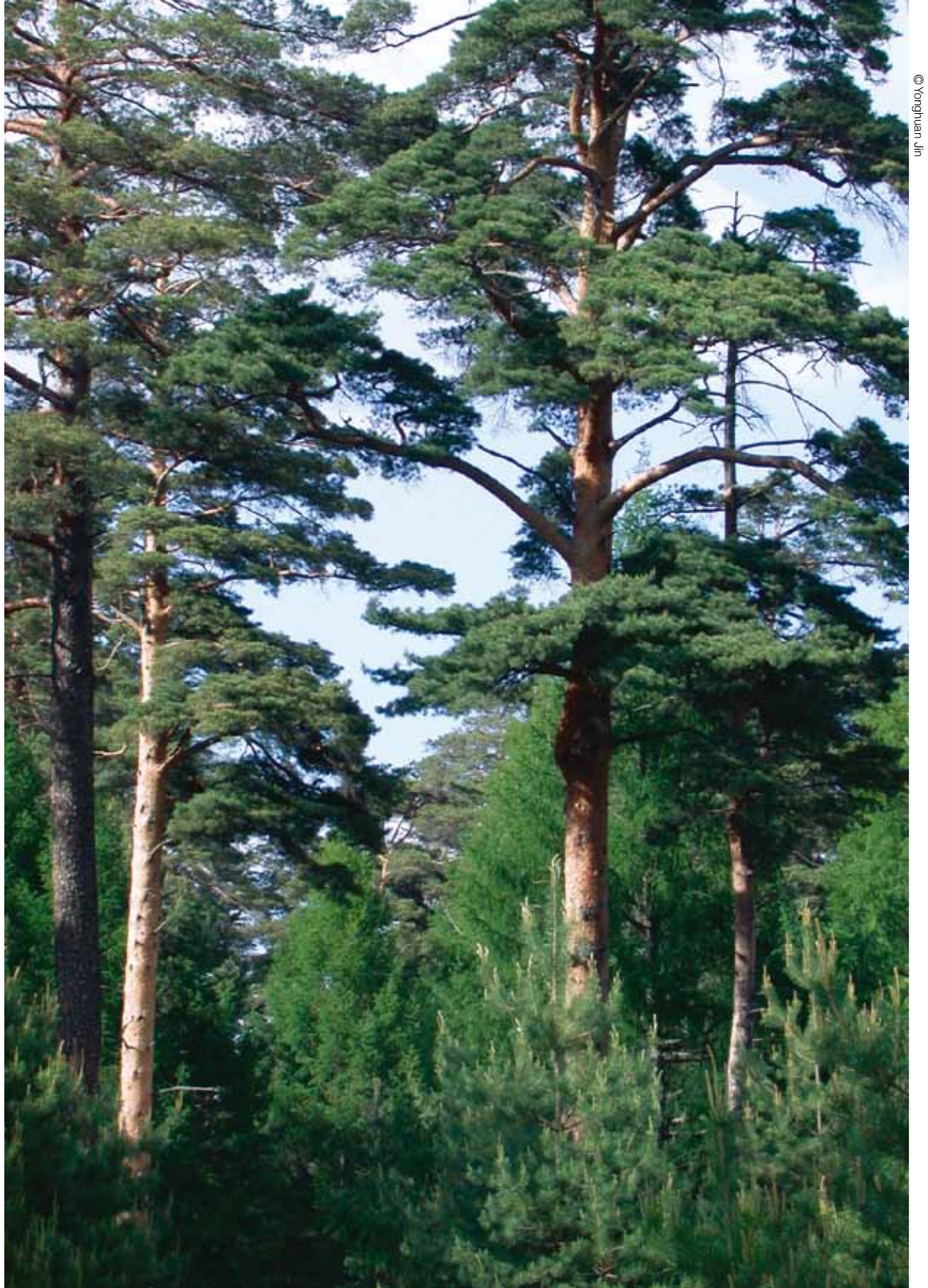
- 长白松
- チヨウハクマツ
- 장백송
- Чанбай – сосны

Description

Trees coniferous, evergreen, 30 m tall. Bark red-brown, flaking. Branchlets dark gray-brown. Winter buds ovoid, resinous. Needles 2 per bundle, blue-green, semiorbicular in cross section, 5–8 cm × 1.0–1.5 mm, stomatal lines present on all surfaces, vascular bundles 2, resin canals 4–8, marginal, base usually twisted, with persistent sheath. Cones dull yellow-brown at maturity, conical-ovoid, 4–5 cm; apophyses broadly rhombic, pyramidal or flat.

Distribution

Endemic to Mainland China [Jilin]



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The pine forest is part of a unique beautiful natural landscape in Changbai Mountain (Mt. Baekdusan). The trunks are very beautiful, with the upper part being red-brown and the lower tan.

Morphological characteristics on leaves, flowers, fruits and tree bark are somewhat like *P. sylvestris* var. *mongolica* and *P. sylvestris*. There is controversy regarding its taxonomy; however, the flora of China treats it as a variety of *P. sylvestris*. The tree has been confirmed as a class II plant under state protection plan in China. Its main distribution area has been classified as nature reserves.

Written by Yonghuan Jin

Pinus tabuliformis Carrière

Pinaceae

- 油松
- マンシュウクロマツ
- 만주흑송
- сосна

©Yonghuan Jin

Description

Trees coniferous, evergreen, 25 m tall, 1 m in diam. Bark grayish brown or dark gray, scaly, crown flat topped, slightly resinous. Needles 2 per bundle, dark green, semiorbicular in cross section, 6–15 cm × 1.0–1.5 mm. Staminate strobili 5–9 mm. Carpellate strobili initially green, turning brown at maturity, ovoid to ovoid-globose, 2.5–9.0 × 4–9 cm, usually persistent for a few years. Seeds pale brown, mature at the 2nd year.

Distribution

Endemic to Mainland China [northeastern, northwestern, central regions]

Pinus tabuliformis is an endemic pine species in China with a wide natural distribution area that is used as an important garden tree in the north of China.

The trees are tall and straight, with branches that bend and thrive. Individuals are beautiful, with leaves that are green year round. Additionally, trees are wind and cold resistant. Pines grown on rock cliffs are known as “greeting pine”. The tree has long received attention owing to its wide natural distribution, strong adaptability, good timber, and good function of soil and water conservation. Due to human activities and global climate change, its continuous natural distribution is gradually becoming scattered and it currently occurs in islands (Guo, 1995).

Pinus tabuliformis is a long living tree. The individuals in Beihai Park and Xiangshan Park in Beijing that have reached 20 m tall are about 800 years old.

Written by Wei Cao

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Potaninia mongolica Maxim.

Rosaceae

- 绵刺
- Монгол хойрго, Хулан хойрго

©J. Sanjid

Description

Shrubs; growing in desert, 30–40 cm tall, long sericeous throughout. Stems gray-brown. Leaves stipules 1.5–2.0 mm; petioles 1.0–1.5 mm; leaflets ca. 2.0 × 0.5 mm, base narrowed, margin entire, apex acute. Flowers ca. 3 mm in diam.; pedicels 3–5 mm; bracts ovate, ca. 1 mm long. Hypanthium densely sericeous adaxially. Sepals ca. 1.5 mm, apex acute. Petals white or tinged pink, ca. 1.5 mm. Filaments adaxially densely sericeous. Carpels densely sericeous. Achenes tinged yellow, ca. 2 mm, hairy, enclosed by persistent sepals.

Distribution

Mainland China [Nei Menggu], Mongolia

©J. Fuenfshueck

Potaninia mongolica is considered a relict of the ancient desert. The species was originated in the desert steppe before large mountains appeared and divided the vast area into smaller valleys (Ulziikhutag, 1989). Thus, the distributional area of the species decreased and it became an endemic to Mongolian province. This is one of the taxa of the province that have been systematically and geographically isolated (Takhtajan, 1978). Written by Dashzeveg Nyambayar

©D. Suran

Primula farinosa subsp. *modesta* (Bisset & Moore) Pax

Primulaceae

- 粉报春变种
- 설앵초

©Hyung Ho Yang

Description

Herbs perennial, 15 cm tall. Stems erect. Leaves in rosettes, oblanceolate or ovate, margin dentate, back side silver powdery, farinose. Umbels 10-flowered, pin and thrum flowers; flower axis 1.5 cm long, glabrous. Calyx 5-lobed, linear, apex acute. Corolla reddish purple, 10–14 mm long, shallowly 5-lobed in the upper part. Capsules short conical, glabrous. Seeds numerous. Fl. May–Jun, fr. Jun.

Distribution

Korean Peninsula [Gyeongsangnam-do, Jeollabuk-do, Jeju-do]

Primula farinosa subsp. *modesta* is an entomophilous plant pollinated by *Osmia* spp. and *Bombus* spp. (Ehrlén, et al., 2002). Flowers mainly produce seeds, but plants can reproduce either sexually or asexually (Hambler and Dixon, 2003). Because the mating system is heterostyly (pin type and thrum type), fertilization between the same type is restricted by a self-incompatibility mechanism (McKee and Richards, 1998; Richards, 2002). Differences in taxonomic treatment exist among studies. *P. farinosa* subsp. *modesta* distributed in Korea is considered to be the same as *P. modesta* var. *fauriei* (Franch.) Takeda in Japan (Lee, 1996), but Yamazaki (1993) and Park (2007) treated it as *P. modesta* var. *hannasanensis* T. Yamazaki. However, Yamazaki (2003) distinguished *P. farinosa* subsp. *modesta* var. *hannasanensis* (T. Yamazaki) T. Yamazaki on Jeju-do Island from *P. farinosa* subsp. *modesta* var. *koreana* T. Yamazaki in southern parts of the Korean Peninsula, suggesting that *P. farinosa* subsp. *modesta* var. *fauriei* (Franch.) Miyabe is native to Japan. Accordingly, a more thorough overall taxonomic study of these taxa is needed.

Written by Seong Won Son

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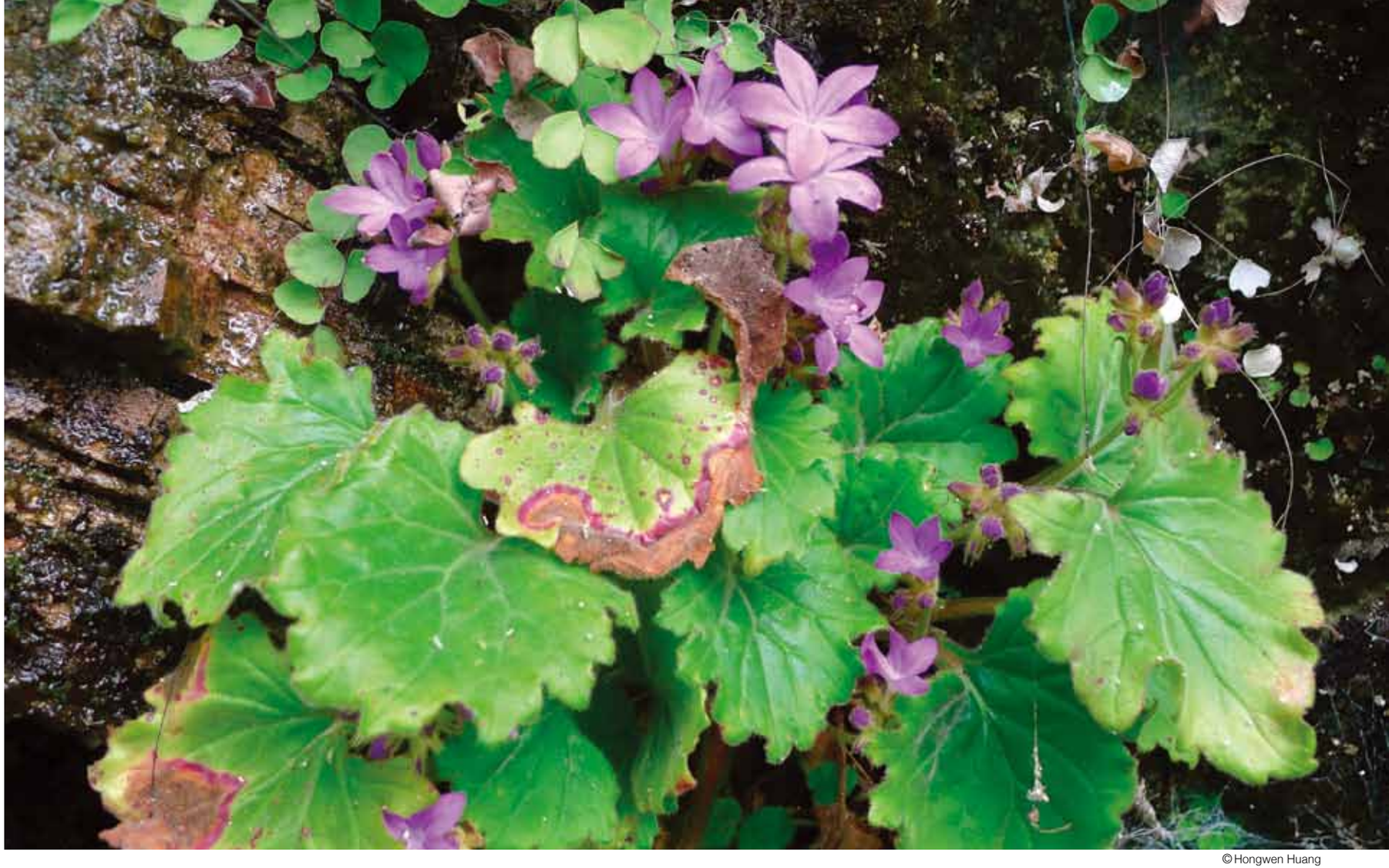
Primulina tabacum Hance

Gesneriaceae

报春苣苔



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Description

Herbs perennial, acaulescent. Leaves all basal, blade broadly ovate or suborbicular, 5–12 cm long, 4.0–12.5 cm wide, apex acute, base shallowly cordate, margin shallowly lobed, sometimes undulate; petioles 2.5–14 cm long, with undulate marginal wings. Cymes 1–2-branched, 3–9-flowered; bracts 2, opposite. Calyx 5-parted. Corolla purple, tube ca. 9 mm long, orifice 3 mm in diam., adaxial lip 2-lobed, abaxial lip 3-lobed. Stamens 2, staminodes 3. Capsules ellipsoid, 3.2–6.0 mm long. Fl. Aug–Oct.

Distribution

Endemic to Mainland China [Guangdong (Lianzhou, Yangshan), Hunan (Yongzhou, Dong'an, Ningyuan, Jiangyong, Lanshan), Guangxi (Hezhou)]

Primulina Hance was established in 1883, at which time it only consisted of one species, *P. tabacum* Hance, found in Lianzhou, Guangdong. This species was subsequently considered to be extinct in the wild for more than 100 years until a few plants were rediscovered in Huangchuan and Lianzhou counties in the 1990s. It is narrowly distributed in northern Guangdong, and was listed as one of the first class protected key wild plants of China in 1999. Recently, more localities have been identified in Hunan and Guangxi, and there are now only eight small populations in the wild. However, recent molecular phylogenetic analyses altered the concept of genetic delimitations among Old World members of Gesneriaceae, *Chiritopsis*, two *Wentsaiboea* species, resulting in all species of *Chirita* section *Gibbosaccus* being incorporated into the monotypic *Primulina* in 2011 (Weber et al., 2011). The newly revised *Primulina* is a monophyletic group comprising > 160 species of perennials that are widely distributed throughout the Karsts regions of China and adjacent countries of Southeast Asia. Approximately 85% of the species are endemic to southern and southwestern China.

Written by Hongwen Huang

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Quercus dentata Thunb.

Fagaceae

- 槲树
- カシワ
- 떡갈나무
- *Дуб зубчатый*

©Hyung Ho Yang

Description

Trees broad-leaved, deciduous, 20–25 m tall, 1 m in diam. Branches slender, glabrous or slightly pubescent when young. Leaves large, among the largest of all oaks, 10–40 cm long, 15–30 cm wide, shallowly lobed margin; petioles short, hairy, 1 cm long. Male catkins pendulous. Female catkins sessile, growing near the tips of new shoots. Fruits acorn, 1.2–2.3 cm long, 1.2–1.5 cm wide, bushy-scaled cups. Nuts ovoid-globose, 1 per cupule, scales of cupules short, appressed.

Distribution

Russian Far East [only on the southernmost and treated as a rare species], Mainland China, Korean Peninsula [all provinces], Japanese Archipelago [Hokkaido, Honshu]

Quercus dentata is one of the most broadly distributed oaks of East Asia. It is one of the most typical representatives of Tertiary flora, having likely retreated from its original distribution in the Pleistocene and re-taking its positions in the Holocene. This oak species is unique in its many characteristics that reflect a spectrum of adaptations to a variety of climatic conditions. The tree has the biggest leaves among oaks and unique foliated acorn caps that differentiate it from other oak species. *Quercus dentata* forms secondary forests after fires, and is able to survive fires, giving it a competitive advantage over other oak species. The tree is common in China, Japan and Korea. In Russia, it is represented by its northern populations and included in the red list.

Written by Pavel V. Krestov

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Quercus glauca Thunb.

Fagaceae

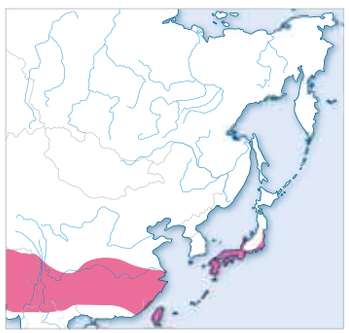
- 青冈
- アラカシ
- 종가시나무

Description

Trees evergreen, 15–20 m tall, 40–60 cm in diam. Branches rather stout, dark brown, yellowish pubescent while young. Leaves alternate, coriaceous, elliptic to obovate-oblong, 7–12 cm long, 3–6 cm wide, acute teeth on upper half, lustrous. Monoecious. Flowers pollinated by wind; stamens 10-15. Fruits nuts, ovate, 1.5–2.0 cm long, ring-shaped patterns on acorn cap. Fl. Apr–May.

Distribution

Subtropical and warm temperate zones: Mainland China, Korean Peninsula [Jeju-do], Japanese Archipelago [Honshu, Shikoku, Kyushu], Taiwan Islands, Indochina, Himalayas



Quercus glauca, a member of the subgenus *Cyclobalanopsis*, is widely distributed across East Asia and is an indicator of the warm-temperate subregion belonging to the Sino-Japanese Floristic Region. A phylogeographic study using chloroplast DNA indicated that the phylogenetic structure of *Q. glauca* was partly different among regions of East Asia, especially in Taiwan (Huang et al., 2002). The genetic variation within species could have been generated by range shifts influenced by climate changes and sea level fluctuations during the Pleistocene. This is a generalist species, occupying a wide variety of sites within its ranges. The species forms not only secondary forests, but also edaphic climax forests on poor soils and steep slopes. This is because the species has relatively high drought and oligotrophic tolerance among the subgenus *Cyclobalanopsis* species. Further studies of evolutional and ecological aspects of the species across East Asia could deepen our understanding of the causes of the current distribution patterns of evergreen broad-leaved forests.

Written by Katsuhiro Nakao

Quercus mongolica Fisch. & Ledeb.

Fagaceae

- 蒙古栎
- モンゴリナラ
- 신갈나무
- дуб монгольский

Quercus mongolica is one of the major components of coniferous and broad-leaved mixed forests in East Asia. *Quercus mongolica* forest is characterized by a stable forest community. The tree has great longevity, and once *Quercus monolica* forests are formed they occupy the habitat for a long time. The tree has thick bark and strong sprout regeneration, enabling it to withstand drought. It is also the most refractory tree among the main trees of the Northeast Asia forest (Chen et al., 1994). *Quercus mongolica* endures low temperature via hibernation before winter and its thick bark. It also adapts to high temperature via its strong transpiration cooling owing to its large leaf blade. *Quercus mongolica* forests from Russia's Siberia to warm temperate zone (-50 to 60°C) show good adaptability. *Quercus mongolica* provides good wood with characteristics of hard timber, beautiful texture, corrosion resistance, and water resistance.

Written by Wei Cao

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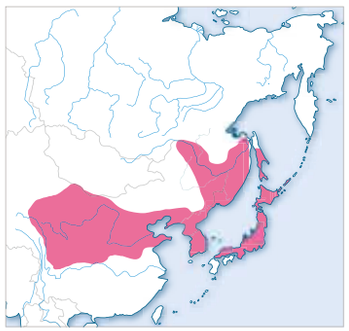
©Wei Cao

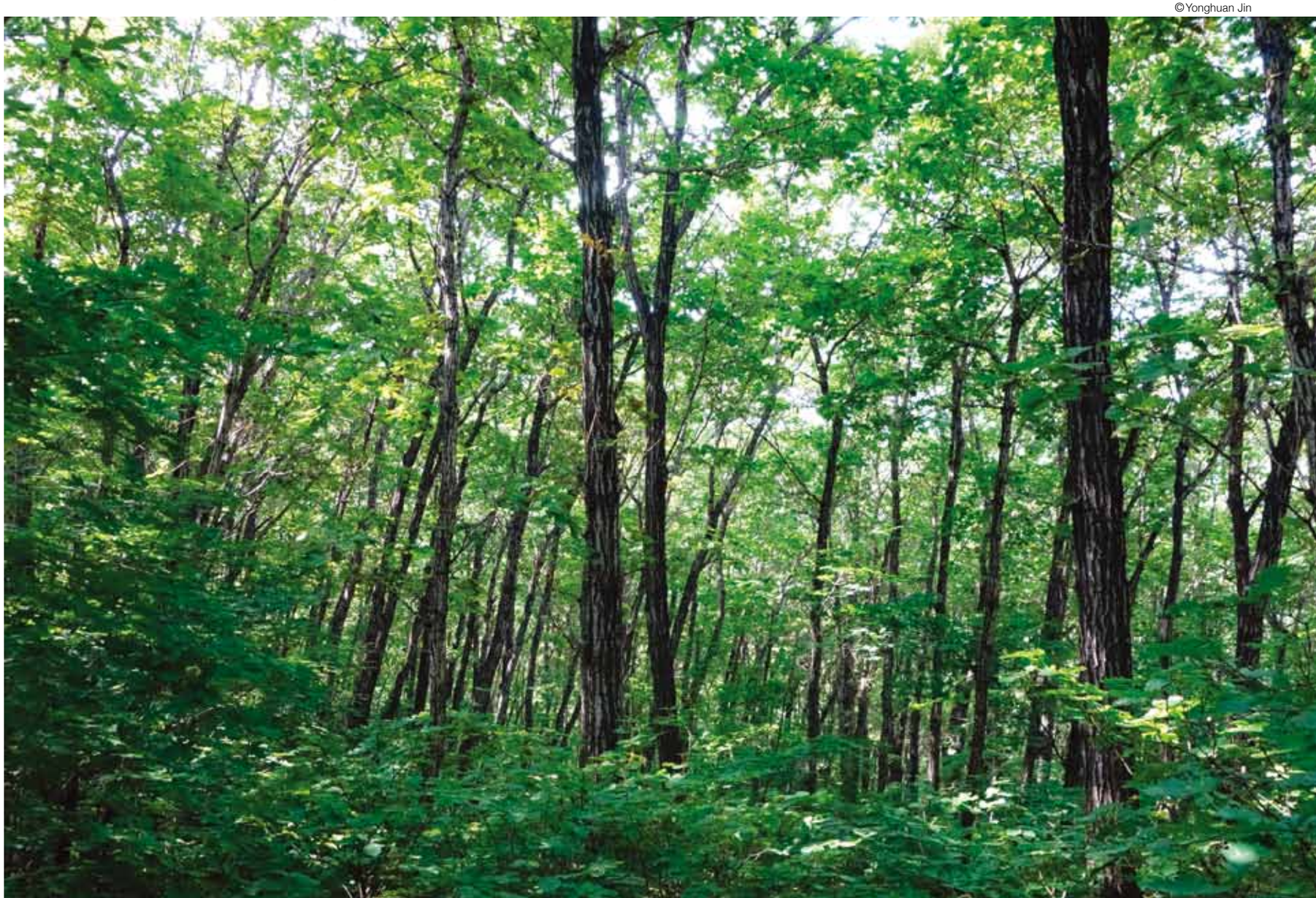
Description

Trees deciduous, 30 m tall. Branchlets lenticellate. Leaves obovate, 7–19 × 3–11 cm, base rounded to auriculate, margin with 7–10 undulate to rough serrations on each side; secondary veins 10–18 on each side of the midvein. Female inflorescences axillary. Cupules cupular, 0.8–1.5 × 1.2–1.8 cm, enclosing 1/3–1/2 of the nut; bracts at the rim of the cupule patent. Nuts 1 per cupule, narrowly ovoid, ovoid, or ovoid-ellipsoid, 2.0–2.4 × 1.3–1.8 cm. Fl. Apr–May, fr. Sep–Oct.

Distribution

Russian Far East, Mainland China [northeastern, northwestern, eastern regions], Korean Peninsula [all provinces], Japanese Archipelago [Hokkaido, Honshu]





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Rhododendron aureum Georgi

Ericaceae

- 牛皮杜鹃
- キバナシャクナゲ
- 노랑만병초
- Алтан тэрэлж
- крафт – кукушка

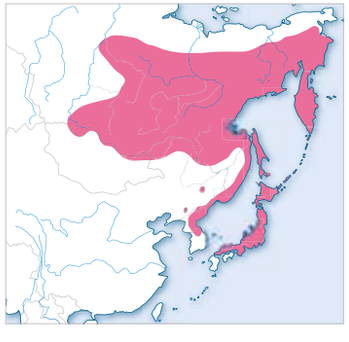
©Yonghuan Jin

Description

Dwarf shrubs broad-leaved, evergreen, 0.1–1.0 m tall. Stems horizontal with obliquely ascending branchlets. Leaves leathery, oblanceolate to obovate-oblong, 2.5–8.0 × 1.0–3.5 cm, reticulate veins distinct. Corymbose 5–8 flowered. Calyx lobes 5, ca. 2 mm long, floccose. Corolla campanulate, yellow, with 1 upper lobe red-spotted, 2.5–3.0 cm, 5-lobed, unequal. Stamens 10, unequal. Infructescences erect, peduncle 4.5–6.0 cm. Capsules oblong-cylindric, 5-valved, 10–14 × 5–6 mm. Fl. May–Jun, fr. Sep.

Distribution

Eastern Siberia, Russian Far East [the Arctic in Asia], Mongolia [Hovsgol, Khentii phytogeographical regions], Mainland China [northeastern, southeastern regions], Japanese Archipelago [Hokkaido, Honshu], Korean Peninsula [Yanggang-do, Jagang-do, Hamgyeongnam-do, Hamgyeongbuk-do, Gangwon-do]



The Chinese name *Rhododendron aureum* denotes "Cowhide rhododendron" due to leaf blades that are thick and tough. The flower, which is abnormal and delicate, is light yellow, elegant, and gorgeous, resulting in its having a very high ornamental value. *R. aureum* is representative of the alpine plants in Changbai mountain (Mt. Baekdusan), China. The rhododendron looks like a short cushion, has highly developed roots, and thick branches and leaves, enabling its adaptation to the alpine climate.

This plant plays a very important role in soil and water conservation and protection of the ecological environment of the alpine zone. The leaf blade remains green, but curls up in the winter, which is a rare characteristic for the trees grown in cold Northeast Asia. The plant is an ideal of potted flower. Many cities are trying to use it in urban planning. If a potted *R. aureum* grown indoors is in good condition, it blooms about 15 days earlier than in the wild, forming dark green leaves (Qiao,1992).

Written by Yonghuan Jin

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Rhododendron pseudochrysanthum Hayata

Ericaceae

- 阿里山杜鵑
- 수도크리산툼만병초
- 玉山杜鵑

©Chien-Fan Chen

Description

Shrubs 3–5 m tall. Leaves crowded, coriaceous, elliptic-oblong to oblanceolate, 2–8 cm long, 2–4 cm wide, base rounded, apex acute and acuminate, margin revolute or not, young leaves covered with floccose-tomentose, becoming glabrescent. Inflorescences 10–20 flowered; pedicels 1.5–3.0 cm long. Calyx minute, 5-toothed. Corolla white or pink, broadly campanulate, 5-lobed. Stamens 10, included. Ovary rufous glandular pubescent. Styles glabrous. Capsules short cylindric, furrowed, glandular.

Distribution

Endemic to Taiwan Islands [The *Rhododendron pseudochrysanthum* complex is distributed from 500 to 3,900 m throughout the island]

Four *Rododendron* species, *R. pseudochrysanthum*, *R. morii* Hayata, *R. rubropunctatum* Hayata, and *R. hyperythrum* Hayata, are closely related. Due to the morphological features, Li et al. (1998) recognized *R. hyperythrum* as a single species and combined the other three names as another species, *R. pseudochrysanthum*. Based on the molecular evidence, all four species are clustered into a single clade and considered as a complex (Chung et al., 2007). This research also suggests that *R. pseudochrysanthum* complex originated from a species distributed in northern Taiwan, *R. rubropunctatum* Hayata. This complex probably spread via north-to-south colonization and was widespread at low and middle elevations during low-temperature periods of the Pleistocene. However, population fragmentation followed the warmer climate, which began in the Holocene, resulting in the present distribution contracting into high elevations (Chung et al., 2007).

Written by Chien-Fan Chen

The *Rhododendron pseudochrysanthum* complex includes *R. pseudochrysanthum*, *R. morii*, *R. rubropunctatum* and *R. hyperythrum*.

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Rosa rugosa Thunb.

Rosaceae

- 玫瑰
- ハマナス
- 해당화
- роза

Rosa rugosa is a well known flower that is traditionally a symbol of love and good things in life. Owing to its color, shape, and distinct aroma, *R. rugosa* is known as the queen of flowers. It was first introduced into Europe (France) from Kamchatka in 1796, then introduced into the United States in 1845 (Hans, 2005). *R. rugosa* is currently cultivated worldwide, and most are grown in the Northern hemisphere.

Wild roses are mainly scattered on the beach, where they have a unique status and function to maintain the coastal ecosystems. They play a role in wind resistance and sand fixation via their strong root tillers. In recent years, human activities in coastal areas such as large-scale tourism and industry have seriously degraded the habitat of wild roses, and *R. rugosa* has been classified as a class II plant under state protection plan in China.

Written by Wei Cao

Description

Shrubs deciduous, 2 m tall. Stems erect, fasciculate, robust, yellowish. Leaves including petiole 5–13 cm, thick; leaflets 5–7, elliptic or elliptic-obovate, 1.5–4.5 × 1.0–2.5 cm, rugose due to concave veins. Flowers solitary, or several and fasciculate, axillary, 4.0–5.5 cm in diam. Petals 5, double or semi-double, purple-red, dark pink, or white, obovate. Fruits hips, dark red, globose, 2.0–2.5 cm in diam. Achenes enclosed in fleshy hypanthium. Fl. May–Jul, fr. Aug.

Distribution

Russian Far East, Mainland China [northeastern, eastern regions], Korean Peninsula [Hamgyeongbuk-do, Hamgyeongnam-do, Pyeongan-do, Hwanghae-do, Gyeonggi-do, Gangwan-do, Chungcheongnam-do], Japanese Archipelago [Hokkaido, Honshu to N Kanto]

Saposhnikovia divaricata (Turcz.) Schischk.

Apiaceae

- 防风
- 방풍
- Дэрэвгэр жиргэрүү

©D. Suran

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Description

Herbs perennial, glabrous. Roots thick and branched, annular, crown surrounded by fibrous remnant sheaths. Stems highly branched from base, thinly ribbed; branches almost equaling stem. Leaves 2–3-pinnate/pinnatisect. Umbels terminal and lateral; bracts absent, bracteoles several, linear-lanceolate. Calyx teeth short, triangular-ovate. Petals white, obovate with incurved tip, glabrous. Stylopodium conic; styles short, elongated and reflexed in fruit. Ovary densely white tuberculate. Fruits oblong-ellipsoid, strongly dorsally compressed; dorsal ribs slightly prominent; lateral ribs narrowly winged. Vittae 1 in each furrow, 1 large vittae in each rib, 2 on commissure. Seeds plane.

Distribution

Russian Far East, Mongolia [Khentei, Khangai, Mongolian Dauria, Foothills of Great Khingan, Khovd, Middle Khalkh, eastern Mongolia phytogeographical regions], Mainland China, Korean Peninsula [northern provinces]

The dry root of *Saposhnikovia divaricata*, Siler, a perennial herb of the carrot family, is also known as Fang Feng in traditional Chinese herbal medicine. When a Chinese herbalist speaks of Fang Feng, they are usually referring to the *Saposhnikovia divaricata* root, *Radix saposhnikoviae*, rather than the plant itself. As a common Chinese herb mainly produced in various regions of northern China, it is known for treating headache, body ache, and pain associated with rheumatoid arthritis. And the famous formula of Fang Feng Tong Sheng Wan is one of its representatives. The main chemical constituents are chromones, coumarins, polyacetylenes, essential oils, and saposhnikovan A and C. Chromones mainly include lede-bouriellol, 4′-O-glucosyl-5-O-methylvisamminol, 3′-O-angeloyl-hamaudol, hamaudol, 3′-O-acetyl-hamaudol, sec-O-glucosyl-hamaudol, 5-O-methylyisamminol, cimifugin, prim-O-glucosylcimifugin. Coumarins primarily consist of bergapten, psoralen, imperatorin, phellopterin, deltoin, xanthotoxin, anomalin, scopoletin, and marmesin. Polyacetylenes are mainly panaxynol or falcarinol, falcarindiol, (8E)-heptadeca-1,8-dien-4,6-diyn-3,10-diol. Essential oil mainly contains octanal, β-bisabolene, nonanal, 7-octen-4-ol, hexanal, cuparene, and β-eudesmol. Fang Feng root was listed in the highest grade herbs by Shen Nong's Herbal Classic.

Written by Magsar Urgamal

Sasa kurilensis (Rupr.) Makino & Shibata

Poaceae

- チシマザサ
- 섬조릿대

Sasa kurilensis is a characteristic species of vegetation in snowy areas in Japan and some islands of Russia and Korea. This species forms the northern and highest edge of bamboo species distributions by adapting to snowy environments, which has an insulation effect against cold and dryness in winter. This species often dominates the forest floor in temperate, subalpine and alpine zones in snowy areas. Dense thickets of the species inhibit the regeneration of tree species, but provide nests and refuges for birds and other animals. Young shoots of the species are highly valued resources as edible wild plants for humans and as forage during spring for animals (e.g., bears). The occurrence of the species, which originated in subtropical areas and propagates vegetatively from rhizomes, in northern islands suggests the existence of cryptic refugia in these areas throughout the glacial periods in the Pleistocene.

Written by Ikutaro Tsuyama

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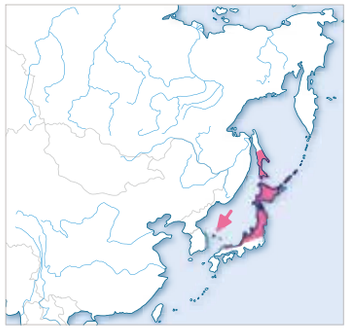
Description

Rhizomes greatly ramified, elongate. Culms 0.5–3.0 m long, sometimes smaller in alpine zones, glabrous, ascending, branched on upper nodes. Culm-sheaths glabrous, shorter than internodes, 2/3 or more split fibrously. Leaves broad lanceolate, coriaceus, 5–20 cm long, 1–4 cm wide, lustrous above, glabrous; ligules tall deltoid. Spikelets few, purplish, 15–25 mm long, densely 3–5 flowered; glumes 2 (1), small, at base; lemmas 7–10 mm long, minutely ciliate.

Distribution

Maritime areas of northern East Asia: Russian Far East [Kuriles, Sakhalin], Korean Peninsula [northern coastal regions, Ulleung-do Island], Japanese Archipelago [Hokkaido, Honshu]



Sciadopitys verticillata (Thunb.) Siebold & Zucc.

Sciadopityaceae

- 金松
- コウヤマキ
- 금송

©Nobuyuki Tanaka

Description

Trees coniferous, evergreen, 30 m tall, 100 cm in diam. Leaves cladodes like, flexible, green, 6–14 cm long, 3 mm wide, brown shoots bearing whorls, obtuse. Flowers diclinous. Fruits cones, 6–11 cm long, mature in about 18 months, many scales, ca. 2.5 cm wide. Seeds 12 mm long. Fl. Apr–May.

Distribution

Endemic to Japanese Archipelago [small and disjunct populations in high rainfall regions of Kyushu, Shikoku, Honshu]

This species, the sole member of the family Sciadopityaceae and genus *Sciadopitys*, is amongst the most relictual of all plants, being the last living member of an ancient conifer lineage, the Sciadopityaceae. The species is morphologically and genetically diverged from all other conifers. Molecular dating shows that *S. verticillata* is considerably older (having diverged approximately 220 Mya) than other recognized 'living fossil' gymnosperms such as *Metasequoia* and *Wollemia* and that it represents one of the earliest diverging plant lineages survived by a single species in the world along with other classic ancient plants, *Amborella* and *Ginkgo*. Although it was an important component of forests across the Northern hemisphere during the late Cretaceous–early Palaeogene (65–49 Mya), the Sciadopityaceae disappeared from these regions in the Pliocene, probably as a result of the onset of Pleistocene glaciations. According to a genetic study (Worth et al., 2013), northern populations in central Honshu of Japan, which are most distant from costal refugia, had the highest chloroplast diversity, and were differentiated from the southern populations, suggesting cryptic refugia close to its current northern range. This species could have survived in these refugia within Japan through the Pleistocene glacial-interglacial cycles.

Written by Nobuyuki Tanaka

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Scrophularia takesimensis Nakai

Scrophurariaceae

■
섬현삼

Over 500 species of *Scrophularia* are distributed in the Northern hemisphere, especially in temperate regions (Shishkin and Bobrov, 1955; Yamazaki, 1993; Hong et al., 1998). Among these, four are now known to exist in Korea (Choi, 2007; Han et al., 2009). *Scrophularia takesimensis*, an endemic and critically endangered species, consists of only a small number of individuals distributed along the coast of Ulleung-do Island, which is a small volcanic island located in the East Sea/Sea of Japan approximately 150 km from mainland Korea (Sun and Stuessy, 1998; Choi et al., 2012). A recent study (Park et al., 2010) indicated that this species might originate from Japanese endemic *S. grayanoides*, which has a limited distribution in Honshu in the northeastern part of mainland Japan (Kamada et al., 2007; Park et al., 2010). *S. takesimensis* is designated as one of the most endangered (category II) plant species by the Wildlife Protection Act of Korea (Ministry of Environment, 2005); however, the construction of coastal roads on Ulleung-do Island is the main threat to the species.

Written by Hyeok Jae Choi

Description

Herbs perennial, 80–160 cm tall. Roots taproots. Stems angular. Leaves glabrous, ovate, 10–20 cm long, 5–15 cm wide, apex obtuse, bases round or subcordate, margin double serrate; petioles 15–55 mm long. Cymes terminal and axillary, rachis panicle-like; peduncles 6–20 mm long. Calyx green, 5-lobed, orbicular, apex rounded. Corolla greenish purple, 8–10 mm long, Capsules ovoid, 2-splitted, 8.0–11.5 mm long, 5.0–7.6 mm in diam. Seeds numerous, dark brown, irregular ellipsoidal to ovoid. Fl. Jun–Jul, fr. Jul.

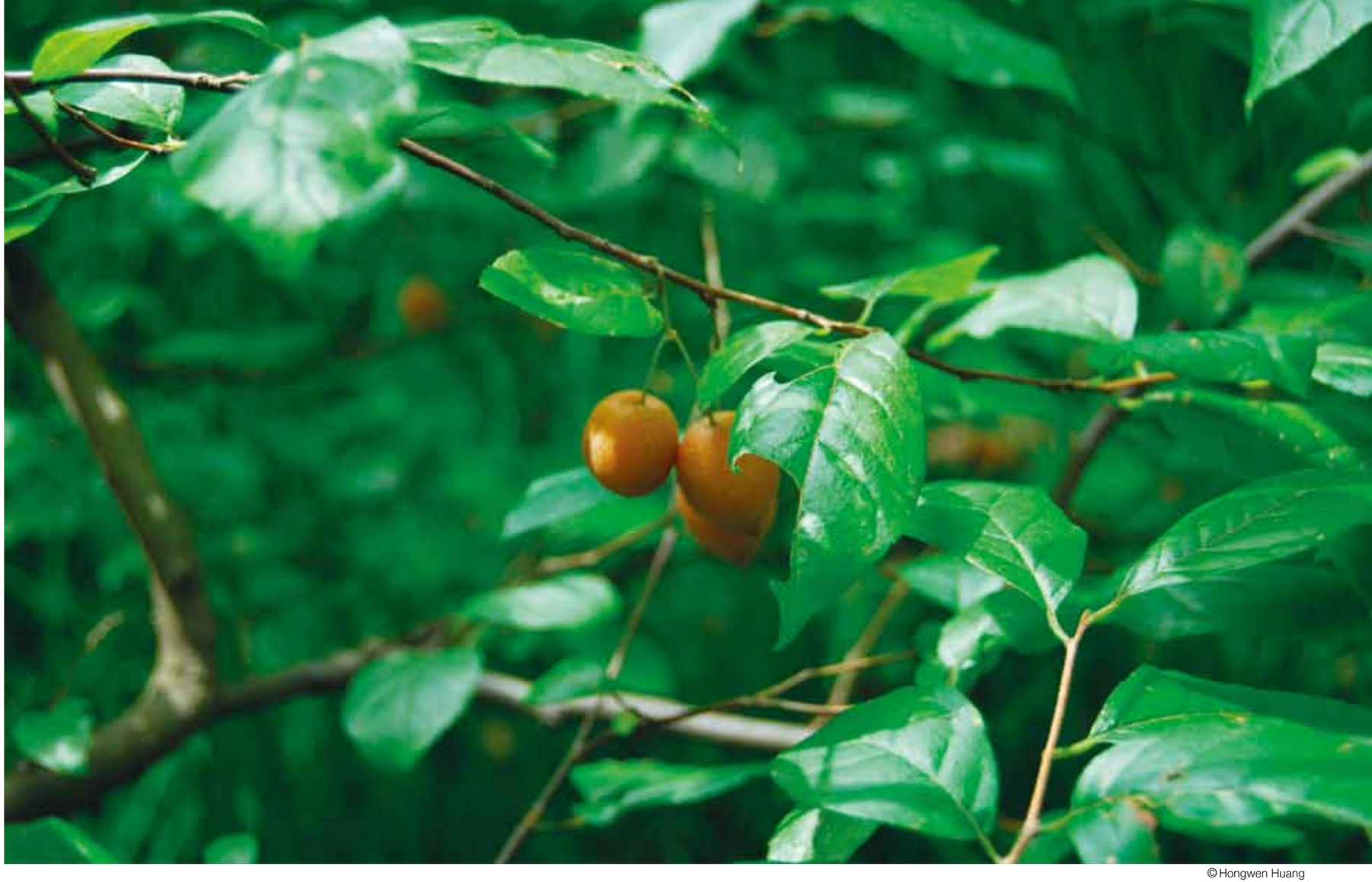
Distribution

Endemic to Korean Peninsula [Ulleung-do Island and two adjacent islets, Juk-do and Gwaneum-do]

Sinojackia huangmeiensis J. W. Ge & X. H. Yao

Styracaceae

黄梅秤锤树



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Description

Trees deciduous, 3–4 m tall. Leaves at base of the flowering branch ovate, others widely ovate to narrowly ovate, 5–12 cm long, 2–6 cm wide; petioles 2–3 mm. Inflorescences racemose, 4–6-flowered; pedicels 2.0–2.5 cm. Petals white, broadly ovate, 10–12 mm long, 9–10 mm wide. Fruits ovoid, including a short and papillate beak. Seeds 1 to 2; seed coat smooth. Fl. Mar–Apr, fr. Oct–Nov.

Distribution

Endemic to Mainland China [Hubei (Huangmei)]

The first report of the genus *Sinojackia* was based on a specimen from Jiangsu province in eastern China, which was recognized as *S. xylocarpa* Hu (Hu, 1929). Since then, Hu (1930) described *S. rehderiana* Hu from Jiangxi, and Merrill (1937) transferred *Pterostyrax henryi* Dummer to *S. henryi* (Dummer) Merrill. Subsequently, Luo (1992) described *S. sarcocarpa* L. Q. Luo from Sichuan, and Chen discovered *S. microcarpa* C. T. Chen & G. Y. Li and *S. oblongicarpa* C. T. Chen & T. R. Cao from Zhejiang and Hunan, respectively (Chen and Li, 1997; Chen, 1998). *Sinojackia oblongicarpa* has also been treated as a synonym of *S. sarcocarpa* (Luo, 2005). *Sinojackia huangmeiensis* discovered by Yao (2007) is endemic to China and known only from a single population of about 200 individuals (including young trees). A strategy to conserve this rare and likely endangered species should be developed, although extensive field surveys for additional populations of the genus are needed to clarify the taxonomic and conservation status of the entire genus. *Sinojackia huangmeiensis* is a very good ornamental plant.

Written by Hongwen Huang

Sinopanax formosanus (Hayata) H. L. Li

Araliaceae

- 华参
- 華參

© Chien-Fan Chen

Description

Small trees or shrubs; branchlets, leaves and inflorescences covered with soft brown stellate tomentose. Leaves simple, coriaceous, palmately-lobed, base truncate, subcordate to obtuse, 5–7-nerved. Inflorescence terminal, corymbose panicle. Flowers sessile, 7–9 in umbellate heads, each flower with three bracts. Calyx margin subentire to minutely dentate. Petals five, triangular, caduceus. Stamens five, with short filaments. Ovary 2-carpellate. Styles 2, purplish-black in mature. Seeds ovoid, with ruminate endosperm.

Distribution

Endemic to Taiwan Islands [distributed in middle to high altitudes]

Sinopanax formosana was originally published by Hayata in 1908 under the genus of *Oreopanax* Decne. & Planch. Li (1949) later transferred it into the genus *Sinopanax* due to its 2-carpellate (vs. 5-carpellate) ovary, hermaphroditic sexual system, and rather short or sessile style (vs. longer style and a flat stigma). Recent molecular phylogenic studies have revealed a sister-group relationship between *Oreopanax* and *Sinopanax* (Plunkett et al., 2004). Fossil evidence has revealed that *Oreopanax* was once distributed in North America (Dilcher and Dolph, 1970), but the extant species only exist in the neotropical zone; nevertheless, *Sinopanax* is a monotypic genus restricted to Taiwan. This Asian-Neotropical disjunctive distribution provides an example and evidence for understanding dispersal events and continental drift.

Written by Chien-Fan Chen

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Taiwania cryptomerioides Hayata

Cupressaceae

- 台湾杉
- 크립토메리오이데스타이와니아
- 臺灣杉

© CR Lin

Description

Trees 70 m tall, 3 m in diam., crown pyramidal shape when young, dome-shape when old. Leaves on young trees linear, sharply pointed, ca. 2 cm long; leaves on old trees scale-like, acute, triangular, ca. 4–5 mm long. Staminate strobili 5–7, densely arranged at the tip of short branchlets. Mature cones terminating the branchlets, nearly sessile, Seeds two in each scale, 5–6 mm long including the wing.

Distribution

Mainland China, Taiwan Islands [distributed at altitudes of about 1,800–2,600 m in the central range], Myanmar, Vietnam

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The populations distributed in China and Myanmar were recognized as an independent species, *Taiwania flousiana*, by Gaussenysoy (1939). However, Liu and Su (1983) and Farjon (2005) found that there is no distinct difference among populations based on the morphological comparison and treated it as a synonym under *T. cryptomerioides*. Despite this, phylogeographic study shows that populations of Taiwan and the SE Asiatic mainland differentiated during the late Pliocene and have reached 95% genetic difference (Chou et al., 2011). The taxonomy of those populations requires further study.

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Taiwania cryptomerioides was first documented as a new genus and species in Taxodiaceae by Hayata (1906). The generic name of *Taiwania* is derived from its discovered location. The species is a Tertiary relictual monotypic conifer once widely distributed in the Northern Hemisphere (Chou et al., 2011). The extant populations are disjunctively distributed in Taiwan, southern China, northern Myanmar and northern Vietnam. The Yunnan–Myanmar border area, northern Vietnam, and Taiwan serve as potential refugia for *T. cryptomerioides* (Chou et al., 2011). *T. cryptomerioides* produces high quality timber that is listed as valuable 5th grade wood in Taiwan. It is used for architectural purposes and coffin making and is known as the “coffin tree”.

Written by Chien-Fan Chen

Taxus cuspidata Siebold & Zucc.

Taxaceae

- 东北红豆杉
- イチイ
- 주목
- тис остроконечный

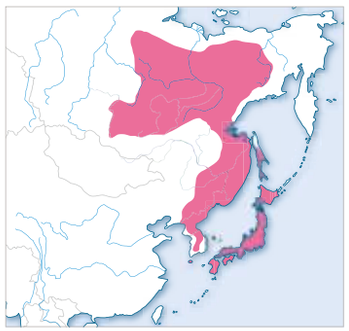
©Yonghuan Jin

Description

Trees or shrubs coniferous, evergreen, 20 m tall, 1.0–1.5 m in diam. Bark reddish brown, with shallow fissures. Leafy branchlets V-shaped in cross section in living state. Leaves dark green and glossy adaxially, linear, almost equally wide throughout length, slightly falcate, 1.0–2.5 cm × 2.5–3.0 mm; stomatal bands tawny yellow. Staminate strobili ovoid or subglobose, ca. 3.5 mm long; arils fleshy, cup shaped, purplish red when ripe, lustrous. Seeds ovoid or trigonous-ovoid, 6.0 × 4.0–4.5 mm. Fr. Apr, fr. Aug–Sep.

Distribution

Russian Far East, Mainland China [northeastern regions], Korean Peninsula, Japanese Archipelago



Taxus cuspidata is a beautiful tree with purplish red fruit and thick green leaves year round that is used as an ornamental garden tree. Additionally, its wood has excellent properties such as being hard, decay resistant, strong, beautiful, containing no turpentine, and purplish auburn heartwood, making it a suitable material for musical instruments, carving, furniture and art decoration.

T. cuspidata is a tertiary relic species that is also associated with species in temperate and cool-temperate vegetation zones, but scattered and slow growing in cold wet habitats. The tree has very limited resources. Its roots, stems, leaves, and bark can be used as a medicine. In 1969, scientists in the United States successfully isolated Taxol from *Taxus* for use in the production of new, highly efficient broad spectrum anticancer drugs. Owing to habitat loss and man-made destruction, the natural population is currently endangered. Accordingly, the tree was confirmed as a class I plant under the state protection plan in China.

Written by Yonghuan Jin

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Thuja koraiensis Nakai

Cupressaceae

- 朝鲜崖柏
- チヨウセンネズコ
- 눈측백
- Туя корейская

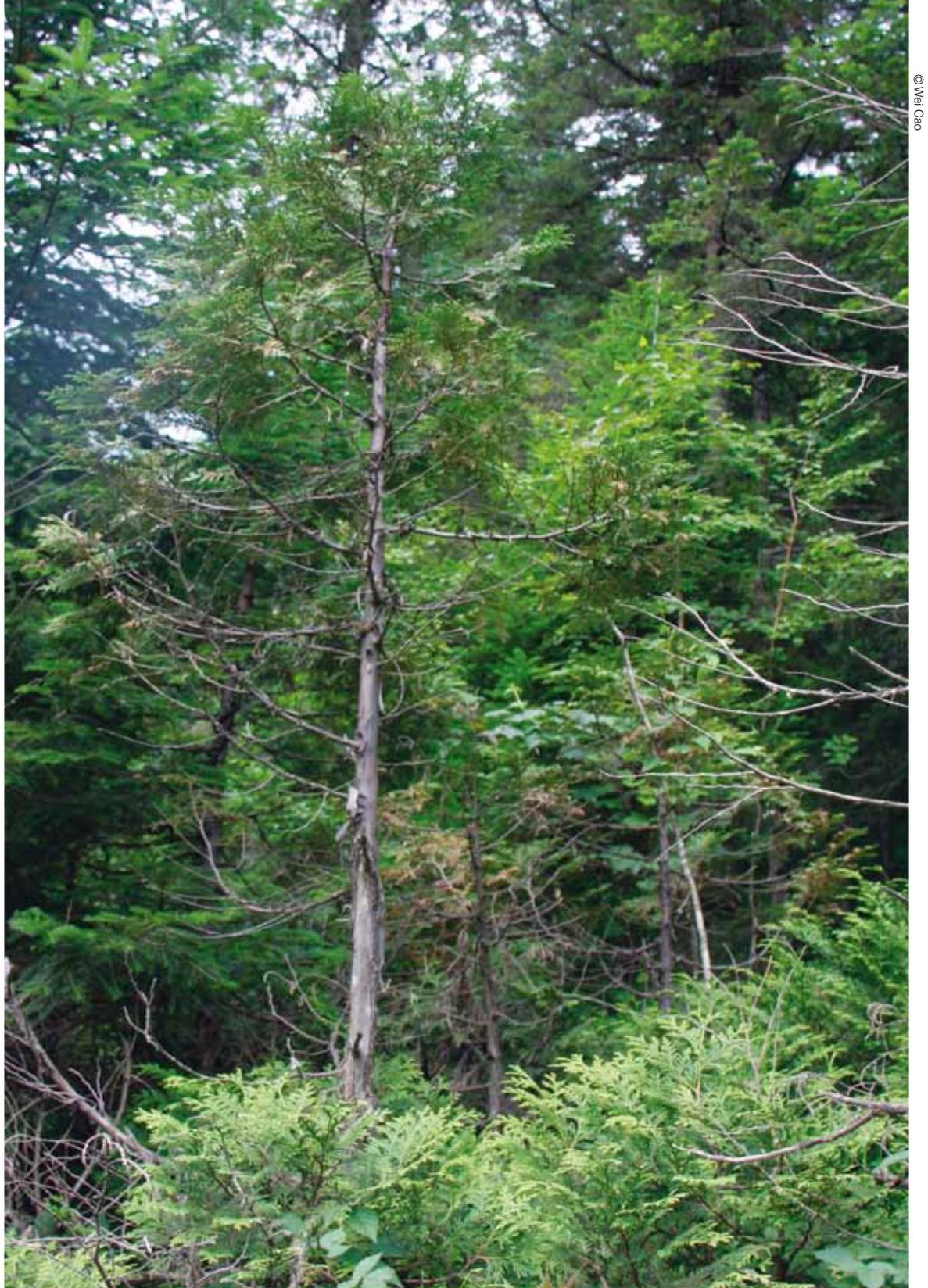
© Yonghuan Jin

Description

Shrubs or small trees coniferous, evergreen, 10 m tall, 80 cm in diam. Bark reddish brown and smooth when young, grayish brown and fissured when old, soon flaking. Branches ascending or spreading, young branchlets glaucous, soon becoming green. Leaves scale-like, apex obtuse, central leaves rhombic, lateral leaves elliptic-triangular, green above, yellowish green below, white 2 lines. Monecious. Staminate strobili purplish, subglobose, 2–3 mm, microsporophylls 6–10. Carpellate strobili dark brown when ripe, ellipsoid-globose, 7–10 × 6–8 mm. Seeds 5–10 per cone, ellipsoid, flattened, about 4 × 1.5 mm; wings 1.0–1.5 mm wide. Fl. May, fr. Sep.

Distribution

Mainland China [S Jilin], Korean Peninsula [Yanggang-do, Hamgyeongnam-do, Pyeongan-do, Gangwon-do]



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Thuja koraiensis is a boreal plant, growing in mountain ridges, inclines, and valleys of the high elevation areas (700–1,800 m) in northeast China and Korea. *Thuja* L. is composed of five species and exhibits disjunctive distributions between Far East Asia and North America (Sun, 2007). Based on the sequence data of cpDNA regions, nrDNA ITS, and two low-copy nuclear genes (LEAFY, 4CL), Peng and Wang (2008) inferred that the cpDNA of Asian species (*T. koraiensis*) is derived from the cpDNA of North American *T. occidentalis* by a chloroplast capture, and Western North America species *T. plicata* has recombinant cpDNA. Furthermore, Peng and Wang (2008) suggested by the comprehensive analyses of geographic, molecular, and fossil data that the genus was originated in North America and then dispersed to Asia through the Bering Land Bridge before or during the Paleozoic era. However, Li and Xiang (2005) inferred that the genus was originated in East Asia and then moved to North America via the North Atlantic land bridge and Bering land bridge. In 1999, it was confirmed as a class II plant under state protection in China. In 2011, it was found that about 2 ha *T. koraiensis* forests were in good condition in the Changbai Mountains (Mt. Baekdusan). Among these, there were more than 100 trees that blossomed and bore fruit, with the oldest one being more than 200 years old. Owing to its very slowly growing property, the annual growth of the trunk is just 1 mm or so, and trees 10 m high or with a diameter of 30 cm rare extremely rare.

Written by Gyu Young Chung & Kyong Sook Chung & Yonghuan Jin

Tsuga diversifolia (Maxim.) Mast.

Pinaceae

- 铁杉属
- コメツガ
- 남일본솔송

© Ikutaro Tsuyama

Description

Trees evergreen, 20–25 m tall. Bark gray. Stems 60–100 cm in diam. Leaves flat, linear shaped, 0.4–1.4 cm long, 1.5 mm wide, dark green; petioles short, curved and twisted. Staminate strobili lateral, axillary, pedunculate, 3–5 mm long, yellow when shedding pollen. Carpellate strobili terminal, pendulous on the outer branchlets of the crown, broadly ovoid, 1–2 cm long, on very short stalks (0.5 mm), maturing from green to shiny brown.

Distribution

Endemic to Japanese Archipelago [from Aomori prefecture in N Honshu to Shikoku Island]

© Ikutaro Tsuyama

This species often dominates subalpine zones of Honshu and Shikoku Islands in Japan. The species grows in areas that are cool and wet during summer. This species can establish on both ground and non-ground microsites (i.e. fallen logs, buttresses, and rocks) in less snowy areas, whereas the establishment of the species depends on non-ground microsites in snowy areas due to fungus injury (snow mold) and/or excessive moisture. Genus *Tsuga* including *T. diversifolia* occurred extensively in Eurasia and North America from the late Cretaceous to the latest Tertiary period (ca. 65.5–3 million years ago). However, *Tsuga* became extinct in northern Eurasia and Hokkaido, during the glacial periods of the Pleistocene (ca. 2.58–0.01 million years ago). Increased summer dryness was suggested as a cause of the extinction from Hokkaido (Tsuyama et al., 2014). Even after summer precipitation and temperature increased in the Holocene (ca. 0.01 million years ago), *T. diversifolia* was not able to migrate back to its former habitats due to geographic barriers such as lowland areas and straits. The distribution pattern of *T. diversifolia* reveals the influence of local extinction during the Pleistocene on the current pattern of habitat occupancy.

Written by Ikutaro Tsuyama

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Vaccinium praestans Lamb.

Ericaceae

- 프래스탄스산앵도
- Красника

Vaccinium praestans is characteristic of humid Sakhalin coniferous forests, where it grows in places with well-developed moss cover. Its contemporary range also covers maritime areas of the Asian mainland in Sikhote-Alin and southern Kamchatka, where it occurs in similar habitats, but its distribution is restricted. *Vaccinium praestans* represent a complex of species of Sakhalin-Japan humidity dependent flora that survived the Pleistocene glaciations, not only in insular sectors of Asia, but also in the Asian mainland, where its populations occupy contemporary refugia. The mainland populations of this species were not been distributed widely in the Holocene and experience very high competition from species better adapted to the conditions of the Asian mainland. The increasing temperature and decreasing humidity may affect the mainland populations in the near future. Its history is similar to that of other boreal species with mainly insular distribution, such as *Ilex regosa* and *Vaccinium hirta*.

Written by Pavel V. Krestov

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Description

Shrubs deciduous, dwarf, 8–12 cm tall. Leaves obovate to round, 2–6 cm long, 2.0–3.5 cm wide, bright green, thin but hard, rounded to acute, toothed margin. Flowers 1–2 on top of the stem, puberuent. Corolla campanulate, pinkish, 5–6 mm long; bracts and bracteoles herbaceous. Fruits berry, globose, bright-red, 8–10 mm in diam., edible and sweet-sour when ripe; receptacles 4–5 mm in diam. Fl. Jun-Jul.

Distribution

Russian Far East [S Kamchatka, Sakhalin, Kuril Islands, N Sikhote-Alin], Japanese Archipelago [Hokkaido, Honshu]

Vaccinium uliginosum L.

Ericaceae

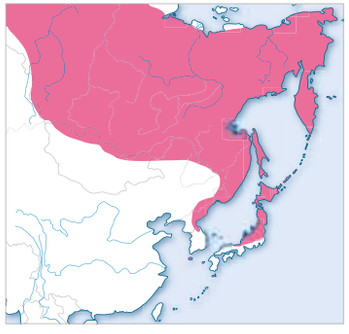
- 笃斯越桔
- クロマメノキ
- 들쭉나무
- Намгийн нэрс
- Голубика

Description

Shrubs deciduous, dwarf, 10–80 cm tall or lower than 10 cm in alpine tundra. Branches glabrous, brownish. Leaves ovate to round, 0.5–4.0 cm long, 0.4–2.5 cm wide, bright green above, bluish beneath; petioles 0.5–1.5 mm long. Flowers 1–3 on the top of 2-year old twigs. Calyx-teeth deltoid. Corolla urn-shaped, pinkish, 4–6 mm long. Fruits berry, globose, dark-blue, 5–10 mm in diam., edible and sweet when ripe. Fl. Jun-Jul.

Distribution

Eastern Siberia, Russian Far East, Mongolia [Hovsgol, Khangai, Khentii, Mongolian Dahuria phytogeographilcal regions], Mainland China [N Heilongjiang (Da Hinggan Ling), S Jilin (Changbai Shan), NE Nei Mongol (Da Hinggan Ling)], Korean Peninsula [northern regions, Jeju-do Island], Japanese Archipelago [Hokkido, central and northern regions], Europe, North America [California]



Vaccinium uliginosum currently marks the circumboreal vegetation zone occurring on somewhat moist sites within a wide elevation range. During the Pleistocene Glacial Maximum in Asia, this species survived in refugia along the Pacific coast from Beringia to Korea and Japan. Its range has shifted considerably southwards. Specifically, 20,000 years ago *Vaccinium uliginosum* occupied all of Korea, the main islands of the Japanese archipelago and most of China. In the Holocene, this species spread over all of North Asia, and now has a stable population. However, it has retreated considerably from its southern reaches, and currently only remains in isolated refugia on the Korean peninsula and Japanese archipelago. Additionally, its range is decreasing under global warming. The isolated populations are of great importance to enable a better understanding of the vegetation history of North Asian vegetation and the ability of high altitudinal (alpine) ecosystems of Japan and Korea to support biodiversity. Its history is similar to that of other boreal species, including *Vaccinium vitis-idaea* and *Empetrum nigrum*.

Written by Pavel V. Krestov

Wasabia japonica (Miq.) Matsum.

Brassicaceae

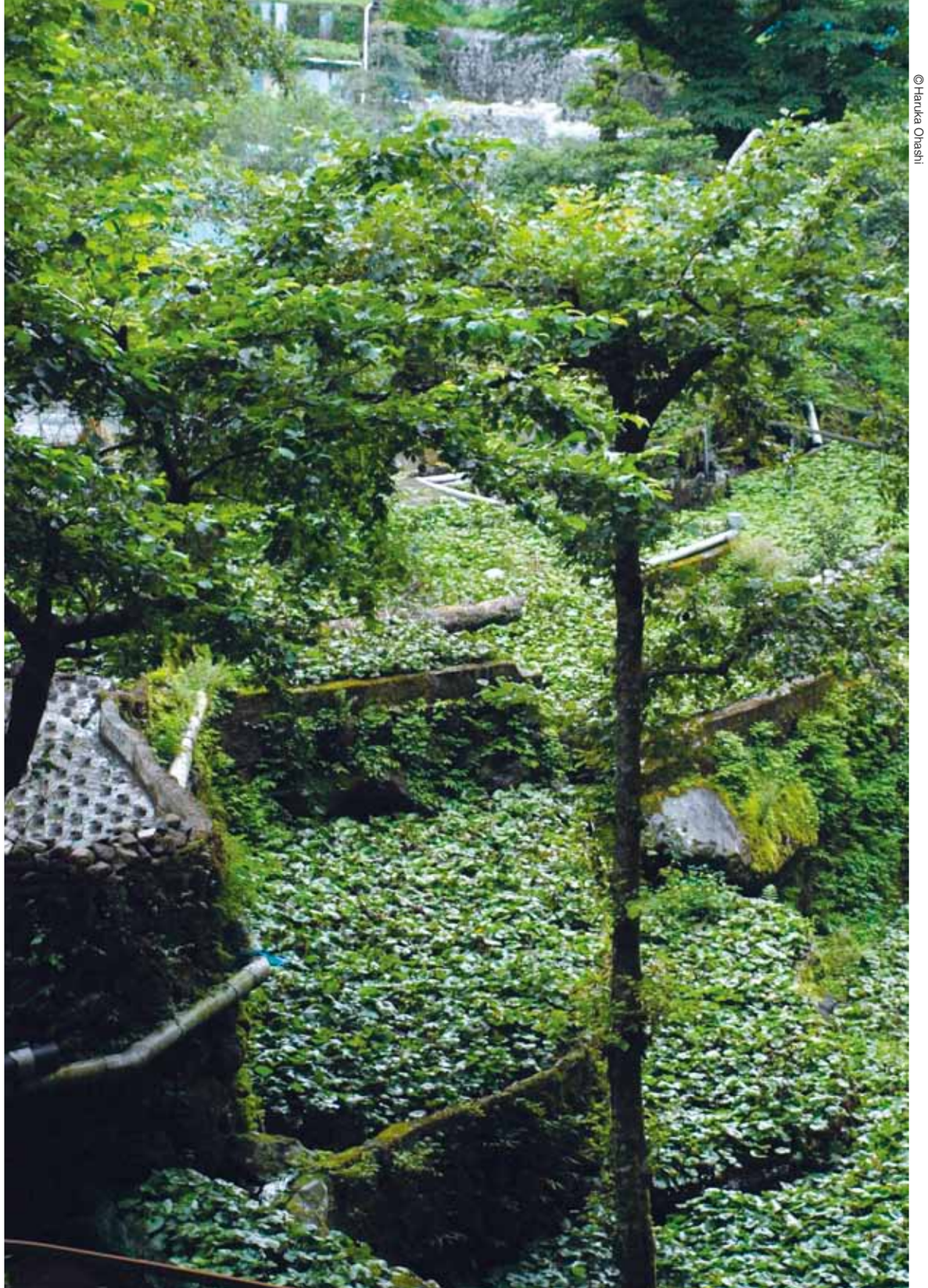
ワサビ

Description

Herbs perennial, glabrous; grow on wet banks of cool mountain streams and springs in Japan. Stems sometimes described as rhizome, cylindrical to conical, covered with numerous leaf scars. Leaves petiolate, cordate-reniform, 8–15 cm long and as wide, undulate-toothed; petioles 30–50 cm long. Flowers white, 8–9 mm long. Petals cuneate-obovate. Seeds silique, mature along the length of the peduncle. Fl. Mar–May.

Distribution

This species was domesticated in Japan and cultivated throughout Japanese Islands and Taiwan Islands: Russian Far East [Sakhalin Island], Japanese Archipelago [Islands], Taiwan Islands



This species has extremely strong flavor and is used as an indispensable condiment for Japanese foods, especially with sushi and sashimi, and soba noodle. The early history of wasabi use is unknown; however, the cultivation of wasabi dates at least as far back as the 10th century. The cultivation of this species is divided into two types: upland field cultivation (Oka wasabi cultivation) and semi-aquatic field cultivation (Sawa wasabi cultivation). Rhizomes emit disinfectants and suppress the growth of other competitive species. However, growth of *Wasabia japonica* itself is also affected by its ingredients, and rhizomes do not develop as much in soil as when cultivated in water. Wasabi grown in flooded systems can produce a large, high quality, premium priced stem. Harvests in upland field cultivation are mainly used for processing of pickles, salad dressings and rice condiments (Chadwick et al., 1993).

Written by Haruka Ohashi

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