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Abstract : Reported field observations in the Parlung Tsangpo area, observations of cultivated specimens from material collected in that area, a survey of all available herbarium sheets as well as a molecular analysis allow to distinguish two different species present in that region. The taxonomic treatment of the Xizang cypresses is reviewed as well as the hypothesis of *C. tonkinensis* presence in southern China. A previous distribution range for *C. austrotibetica* is corrected and new maps are proposed. For many years *C. austrotibetica* was attributed to other different cypress species.

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Bulletin No 23

Cover photo: Mighty *Cupressus austrotibetica* SW of Tongmai, Xizang, China. 1992. © R. Businsky.

Cupressus rushforthii, a new cypress species in Xizang, China

With an introduction on the Chinese cypresses and a survey of *C. austrotibetica*.

The first mention of the genus *Cupressus* in China to reach European countries at the end of the 18th century occurred when G. Staunton (1797) published his record when he accompanied the diplomatic mission from King George III to the Emperor Qianlong of China. He mentioned cypresses in cemeteries, especially in one cemetery close to the See-Hoo [Xihu] lake, in Zhejiang province. An engraving shows the trees surrounding the tombs (see Fig. 20, p. 66). There was, however, some confusion as the pendulous foliage of one of those trees led to it being mistaken with the *C. pendula* described by Thunberg – this ‘species’ later being identified as based on the cultivar ‘Filiformis Pendula’ and thus a synonym of *Thuja orientalis*¹ (cf. Maerki 2017), despite Staunton clearly mentioning the presence of “a species of weeping thuya, or *lignum vitae*, with long and pendent branches, unknown in Europe, [which] overhung many of the graves.” (1797: 445-446). This confusion appeared in the different editions of Lambert (1803, 1832) when one plate (see Fig. 26, p. 66) reproduced correctly the new *Cupressus* species (under an incorrect name) and erroneously as a cypress the pendulous tree overhanging the tombs (see Fig. 27, p. 66). Finally Staunton’s new *Cupressus* species was given its currently accepted name under *C. funebris* by Endlicher (1847: 58). Unfortunately Endlicher cited again the “Weeping Thuia or *Lignum vitae*” giving as a reference the plate of Fig. 25 (p. 66)². Art works are not always accurate to identify conifers species or even genera. On the plate (Fig. 25, p. 66), there is a smaller tree in the centre left middle ground which can be identified as a stylised *C. funebris*. The natural range of this cypress is unknown; in the north it is found in the basin of the Huang He to the south of Gansu and the east of Sichuan, and from there to the temperate parts of southern China.

The second Chinese *Cupressus* species was described 67 years later by A. Camus in 1914 as *C. duclouxiana*, native in Yunnan and SW Sichuan. There was a wait of another 50 years before S. Hu (1964) described a third species *C. chengiana*, which is endemic from the Min Jiang drainage in Sichuan. This was quickly followed by *C. fallax* by Franco (1969) also endemic of Sichuan, which was initially reduced to synonymy with *C. chengiana*, before being emended and rehabilitated as a valid species by Maerki & J.Hoch (2020). *C. gigantea* was the next, fifth species, described by W.C. Cheng & L.K. Fu in 1975, an endemic to Xizang (cf. Maerki 2013) on the banks of the middle Yarlung Tsangpo. Then in 1988 Silba proposed a new species based on specimens collected near Trulung on the Parlung Tsangpo drainage in southeastern Xizang Autonomous Region: *C. austrotibetica*. In 1994 Silba added *C. tongmaiensis* from the same area. Subsequent to the discovery of *C. vietnamensis* in 1999 in Vietnam by Vietnamese botanists, this species was also found native in Guangxi (southern China) in 2012. Most recently, the Gansu Cypress was acknowledged as a valid species in 2020 (*C. gansuensis*, Maerki & J.Hoch, 2020)³. Except *C. vietnamensis*, all these other cypresses are endemic to China. The history of the Latin names successively applied to the cypresses in China is still to be written: the binomial *C. torulosa* was applied by at least one author to the following species: *C. duclouxiana*, *C. chengiana*, *C. fallax*, *C. gigantea*, *C. austrotibetica*, *C. gansuensis* (and even to *C. tonkinensis* endemic to Vietnam, see Appendix F). Currently there is no record of the presence of *C. torulosa* in China.

A review of the species from southeastern Xizang described by Silba is necessary.

Silba’s southeastern Xizang cypresses

Silba gives the following descriptions of his two Chinese species based on herbarium material.

Cupressus austrotibetica (Silba 1988):

Arbor ad 20-60 m. alta. Ramulis multum tenuioribus, gracilibus. Folia acuta vel obtusiuscula, 1.2-1.5 mm. longis, glandula mediana rotunda bene impressa. Strobilis ovulatis 1.2-1.6 cm. longis, squamis 10-12.

Type: Ludlow, Sherriff & Elliot 12141, Tibet, Trulung, Pome, 2134 m., more numerous up the river, in mixed forest (Holo-BM, Iso-E); **Paratypes:** Ludlow, Sherriff & Elliot 12130, Tibet, Trulung, Pome, 1981 m. (BM, E); Bailey s.n., Tibet, upper part of Tsangpo Tsangden, Yigung, 2286 m., June-Sept. 7, 1913 (E).

A tree 20-60 m. tall. Branchlets divided into thin, thread-like segments, or some-what flattened. Leaves bluntly acute, 1.2-1.5 mm. long; glands apparent but obscure, with a small pit. Female cones globose or subglobose, dark brown, 1.2-1.6 cm. long, with 10-12 scales, inner scales dark brown, umbos inconspicuous. Seeds dark brown, subglobose, with rounded wings, ending in an acuminate point at the end opposite the hilum.

¹ Now *Platycladus orientalis* (L.) Franco.

² “Weeping Thuia or *Lignum vitae* Staunton Embassy to China II. 445. t. 41.” (Endlicher 1847: 59.)

³ For the presence of the Vietnamese *C. tonkinensis* in China, see Appendix F.

Cupressus tongmaiensis (Silba 1994):

Ramulis aequaliter dispositis, non distichis planeis. Foliis subacutis vel obtusis, marginibus perlucidulus bene distinguuntur. Strobilis femineus globosis, squamis beneis glaucis conspicuis, squamis 10, fereis umbonatis prominentibus. Seminibus glaucis.

Holotype: Tibet, southern region, Yigrong Valley, near Tong Mai, to 2070 m. on eastern slopes, Hong, D.Y. & Yeng, J.S. 650772 (holotype-PE).

A small tree to 20 m. tall. Branchlets twisted as in *Cupressus torulosa* D. Don. Leaves with a distinct translucent margin, bluntly acute, resin glands conspicuous on young trees. Female cones globose to subglobose, dark brown, with small umbos, seeds sometimes glaucous and often medium brown in color.

There are some problems with those descriptions as the Latin diagnoses (mandatory at the time and the only valid ones) do not correspond exactly with the English versions. For instance, for *C. tongmaiensis*, seed cones are globose in Latin and globose to subglobose in English; or branchlets disposed equally, not distichous in a plane (Latin) compared to twisted branchlets as in *C. torulosa* in English. For *C. austrotibetica* the seed cones are either egg-shaped (Latin) or globose or subglobose (English). No statistical data are provided.

C. austrotibetica is one of the rare cypresses which can be identified at first glance by its foliage⁴. The branchlets are very thin and often elongated giving the impression of airy foliage. This feature is clearly visible on most if not all herbarium sheets (see Appendix A) and in the photos of Figs 5, 7 & 9 and justify species rank for this taxon⁵.

A further and more serious problem concerns the type chosen by Silba for his *C. tongmaiensis*. In the Beijing herbarium are three sheets⁶ of the material collected on the 23 July 1965 by Ying Junsheng and Hong Deyuan (coll. number 650772). Two of these herbarium sheets (PE00012995 & PE00012996) have been determined previously by Silba as *C. austrotibetica* (citations labels dated 31 January 1990). The collection locality is on the right shore of the Yi'ong Tsangpo, on an eastern facing slope at 2070 m, west of Tongmai (Appendix A, #6, cf. Map 2). All the available material from the Yi'ong Tsangpo belongs to *C. austrotibetica* and the Ying & Hong 650772 herbarium sheets are no exception as the thin foliage allows determining these samples as *C. austrotibetica*. Therefore *C. tongmaiensis*⁷ is here reduced to synonymy of *C. austrotibetica*.

Visiting southeastern Xizang on more than one occasion, Rushforth had the opportunity to collect samples from the cypresses of the Parlung Tsangpo valley: KR5528, KR5728, KR6005, KR6015, KR7010 and KR7203 (see Appendix A for collection details and Map 1). He noted that two kinds of cypresses could be distinguished by their very different foliages. The question arose to understand if it is possible to have two *Cupressus* species in the same area. In California there are several such examples:

- *C. macrocarpa* and *C. goveniana* – separation distance less than 3 km;
- *C. stephensonii* and *C. forbesii* – distance 9 km;
- *C. abramsiana* and *C. butanoensis* – distance 11 km;
- *C. pygmaea* and *C. sargentii* – distance 16 km;
- *C. bakeri* and *C. macnabiana* – distance 20 km;
- *C. bakeri* and *C. nootkatensis* – distance 6 km;
- *C. sargentii* and *C. macnabiana* – distances from 0 km.

The latter pair produce natural hybrids, and is hitherto the only example of two different cypress species growing naturally in the same locality or on the same slope.

Material is in cultivation from several sources, e.g. at the Sir Harold Hillier Gardens and Arboretum or in Ireland as well as two collections by Rushforth. KR5528⁸ is typical *C. austrotibetica* (cf. Figs 5, 7 & 9), while KR6015 is quite different in habit and foliage (cf. Figs 6, 8 & 10). Moreover material of

⁴ Other such cypresses are *C. macnabiana* and *C. vietnamensis*.

⁵ Some authors – such as Farjon (2013: the Curtis's Bot. Mag. illustration of a *C. torulosa* is a *C. lusitanica*; 2016), who mistook *C. lusitanica* with *C. torulosa* – still make *C. austrotibetica* a synonym of *C. torulosa*. The distance between these two species (southeastern Xizang to central Nepal) is more than 1000 km, with the Himalayan range between them. Furthermore the climatic conditions are different: rainforest for *C. austrotibetica* and a drier climate where *C. torulosa* is growing.

⁶ PE00012995, PE00012996 & PE00012997, see #6 in Appendix A. As Silba did not specify which sheet is the type, we are choosing PE00012995 as the lectotype, *hic designatus*.

⁷ For the other combinations by Silba, see Appendix B, p. 74.

⁸ Samples were collected on the trees grown from KR5528: see Appendix A, #30.

C. austrotibetica (KR5528) and KR6015 were included in a study on the cypresses of the eastern hemisphere (Rushforth *et al.* 2003: molecular analysis using RAPDs). The results are summarised on Fig. 1 (below) and show that KR5528 and KR6015 are sister taxa in a cluster with *C. gigantea* and *C. duclouxiana* and away from the other Asiatic species included in the study. On the cladogram, KR5528 and KR6015 are well separated. Comments about this result read (Rushforth *et al.* 2003: 21): “Individuals from the two sampled sites of *C. austrotibetica* population are almost as different as some of the recognized species in this study (Fig. 1).” Thus, morphological and molecular data point to the evidence that they are different species despite the fact that they both inhabit Bomê County of Linzhi Prefecture. KR6015 was collected on the right bank of the upper Parlung Tsangpo, to the east of Tongmai, while *C. austrotibetica* belongs more to the west, along the Yi’ong Tsangpo drainage and further west and south after the junction with the Parlung Tsangpo, and further south to the Yarlung Tsangpo drainage (cf. Maps 1 & 2).

Rushforth commented upon his KR6015 material that it was collected from “one of two trees growing at the edge of a steep cliff at the edge of a small side stream on the right bank of the Parlung Tsangpo, but in some shade from the mountains to the south, on the left bank. Cones with 8 scales, scales with prominent projections, only round when circa 5+ years old ^[9] less than 1 cm diameter and thus much smaller than *C. duclouxiana*”.

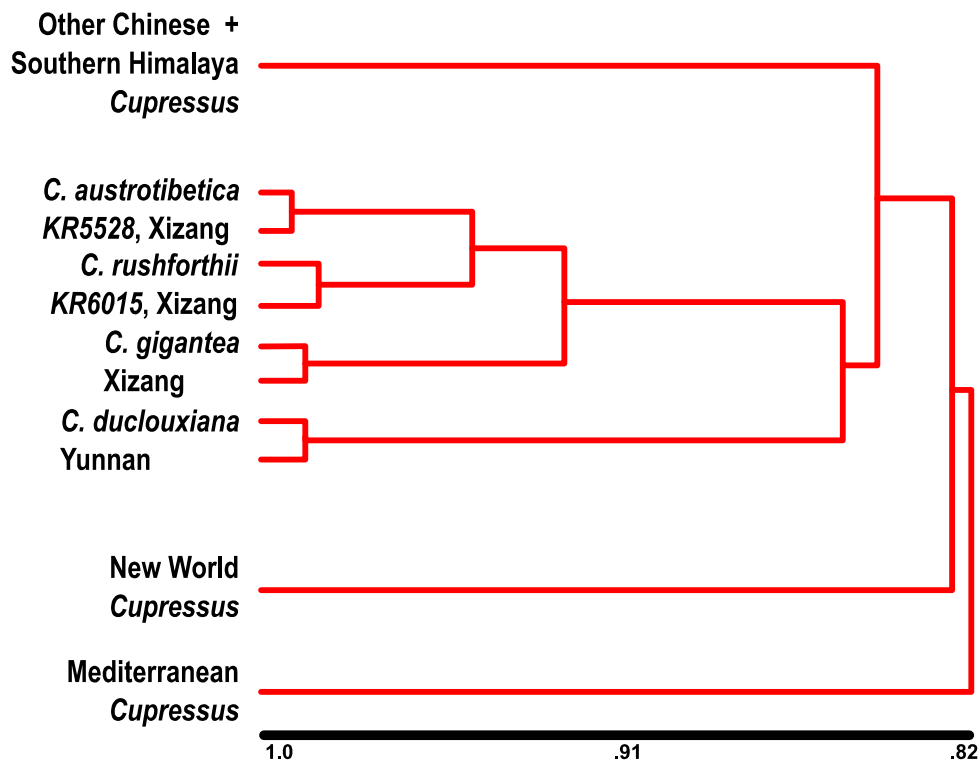


Fig. 1: Minimum spanning network based on 329 RAPD bands. (Rushforth *et al.* 2003, Fig. 1).

Thus, KR6015 belongs to a new species still to be described, which is done here.

Cupressus rushforthii Maerki & J.Hoch, *spec. nov.*

Holotype: Tree cultivated at Ness Botanic Garden from KR6015 clone B; China, Xizang, Bomê County, Parlung Tsangpo, above the confluence at Tongmai, close to Tangdui (30°06′07.16″N, 95°06′15.41″E), 2100 m, *T.Baxter s.n.* (holotype-LIV-2005.15.2873).

Description: *Bark:* red-brown on saplings, exfoliating in plaques (Figs 17 & 18), later turning grey and exfoliating in stripes (Figs 19 & 20). *Foliage:* ultimate shoots disposed in flat sprays, leaves acicular adpressed often with an inactive resin gland on facial leaves and clearer margins (Fig. 11). *Seed cones:* globose, dark green before maturity with small light green mucros, turning light brown to dark brown and opening at maturity (Fig. 12), wider than long on average¹⁰, 14.44 mm wide versus 13.79 mm long

⁹ When the cones are weathered.

¹⁰ Sample size: 18.

(ratio length/width: 0.96), with width range from 11.9 to 16.2 mm and length range from 11.9 to 15.4 mm; number of scales: 10 (61.1%), 12 (16.7%), 9 (11.1%), 8 (5.6%), 11 (5.6%). Enclosing parallelepiped rectangle: average: 2.70 mm³ with range from 1.59 to 3.65 mm³. One cone with a columella. *Seeds*: 3 to 4 mm long and 2 to 3 mm wide when fully developed, narrow wings, with a marked tip at the extremity opposed to the hilum. *Cotyledons*: two. *Seedlings*: to 20-25 cm tall after one growing season, still with glaucous juvenile foliage, branches spreading regularly and almost horizontally. Dimorphic intermediate leaves, in flat sprays, from the second growing season. (Figs 14-16).

Further comments: the name of this new species was chosen in honour of Keith Rushforth who discovered it during his trip to Xizang in 1999.

Rushforth's collection was from one of two trees growing side by side by a small stream adjacent to a vertical cliff¹¹ where only these two trees were observed. This isolated setting of these two trees beside a stream suggest that their origin was from seeds carried by the stream down from the slopes, which rise to over 4000 m. Fig. 2 is a photo taken of the slope above Tongmai and Tangdui. It shows the slope is covered by angiosperms (mostly at lower altitudes) and conifers (more abundant at higher altitudes). However, this photograph does not show the presence of *C. austrotibetica* with its typical narrow columnar and slender habit, as seen in Figs 3 & 4, but broader crowned trees (compare Figs 5 & 6). Ludlow had already noticed that the vegetation between the two sides of the Parlung valley east of Tongmai was very different, one slope fully exposed to the south and the other to the north (cf. p. 84). This can explain the presence of two different cypress species in the area. As Map 2 demonstrates, most if not all collections were done close to the roads. *C. austrotibetica* is growing on very steep slopes, often above cliffs, which are inaccessible by normal methods. Thus, seedlings can be found on the side of the road from seeds fallen from much higher altitudes or, like in the case of *KR6015*, from seeds carried by water. It will be necessary to explore the mountain above Tangdui in search of the parent trees to be able to assess this new species' population.

Conservation status: Data Deficient (DD) until an exploration of the mountain can be organised and a correct assessment carried out. So far, the best protection could be assured by the difficulties to access these populations. For *C. austrotibetica*, see Appendix E, p. 86.



Fig. 2: Slope above Tongmai; 30°06'9.35"N, 95°04'46.20"E. To compare with the photos of Figs 3 & 4 where the *C. austrotibetica* appear clearly the dominant trees on the steep slopes of these valleys. Photo © Hunag Xueyun

¹¹ Collection was done from the top of that cliff below the road. Seed of *KR6015* was collected from the only reachable branches on one of the trees. Two seedlings raised from this seed have been given the suffices A and B.



Fig. 3: The *C. austrotibetica* on both sides of the Yi'ong valley display their typical narrow columnar habit. They do not occupy all the slopes, but most usually a corridor from bottom up. This disposition is also clearly visible on Fig. 4. Photo © Jessie Lee



On *C. austrotibetica* conservation issues, see Appendix F.

Fig. 4: Parlung Tsangpo flowing south-east after Trulung. The village is some 1600 m to the left from the road visible in the middle-ground with Tibetan flags above the road. The cypresses look like flowing down the slope, occupying some crest lines.



Fig. 5: *C. austrotibetica*, RBG Kew.



Fig. 6: *C. rushforthii*, Bedgebury Pinetum.

Fig. 7: *C. austrotibetica*, Ness BG. Notice the thinner foliage of *austrotibetica*. (cf. also Fig. 9).



Fig. 8: *C. rushforthii*, Ness BG.



Fig. 9: *C. austrotibetica*, cultivated, RBG Kew.

Fig. 10: *C. rushforthii*, cultivated, Ness BG. Figs 7, 8 & 10: photos © T. Baxter.





Fig. 11: Shoot of *C. rushforthii* (KR6015, clone B), leaves closely adpressed, ultimate branchlet thicker and less elongated than on *C. austrotibetica*; cultivated, Ness Botanic Garden, South Wirral [Liverpool], UK. Photo © T. Baxter.

Fig. 12: Cones of *C. rushforthii* (KR6015, clone B) close to maturity with colour turning from dark green to brown; cultivated, Ness Botanic Garden, South Wirral, UK. Photo © T. Baxter.





Fig. 13 (left):
C. rushforthii,
cutting from
KR6015, clone A.
Height: 63 cm.



Fig. 14 (right):
C. rushforthii,
seedling from seed
collected on
KR6015, clone B.
Height: 67 cm.

Most seedlings had 2 cotyledons, and a few 3 or 4. While growing, those last ones displayed a complete different pattern and colour. They are more than likely hybrids. All other well developed seedlings have the same characteristics: quite regular shape, juvenile foliage during the first year and begin of the intermediate foliage during the second growing season, while keeping a glaucous colour.

Fig. 15 & 16: Close-up of the foliage of the seedling of *C. rushforthii* (cf. Fig. 14).

Fig. 15 (right): Intermediate foliage, shoots of the upper part of the seedling: dimorphic leaves and ultimate branchlets in a plane.

Fig. 16 (left): Juvenile foliage with longer needles and whorls of three leaves.

Scales: left, ~1.4x; right, ~2.3x





Fig. 17: Cultivated, private collection, *KR6015*, clone B.

Fig. 18: Cultivated, private collection, *KR6015*, clone B.

Figs 17-20: Barks of *C. rushforthii* at different heights and ages. Figs 13-14 © by owner. Figs 15-16 © T. Baxter.

Fig. 19: Cultivated, Ness BG, South Wirral [Liverpool].

Fig. 20: Cultivated, Ness BG, South Wirral [Liverpool].





Fig. 21: Seeds of *C. rushforthii*, from cultivated tree in Ness Botanical Garden, South Wirral.

Scale: 2x.

Seeds collected from *C. rushforthii* (KR6015, clone B) of the Ness Botanical Garden were sown at different periods in lots of 100 or 200. The seeds were soaked in tap water for 72 hours, then sown in an acidic medium. They germinated readily without any other pre-treatment and within one week. Germination rate was regularly 10%.

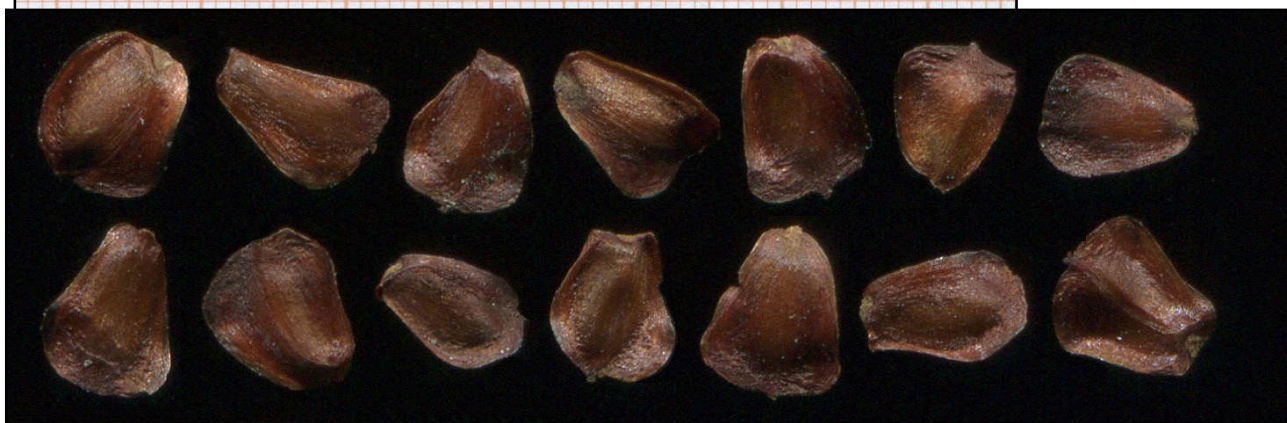


Fig. 22: Selection of seeds from Fig. 17. Scale: ~5.65x.

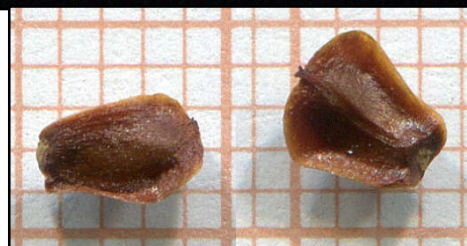


Fig. 23: Seeds on a millimetre paper background. Scale: ~5.65x.

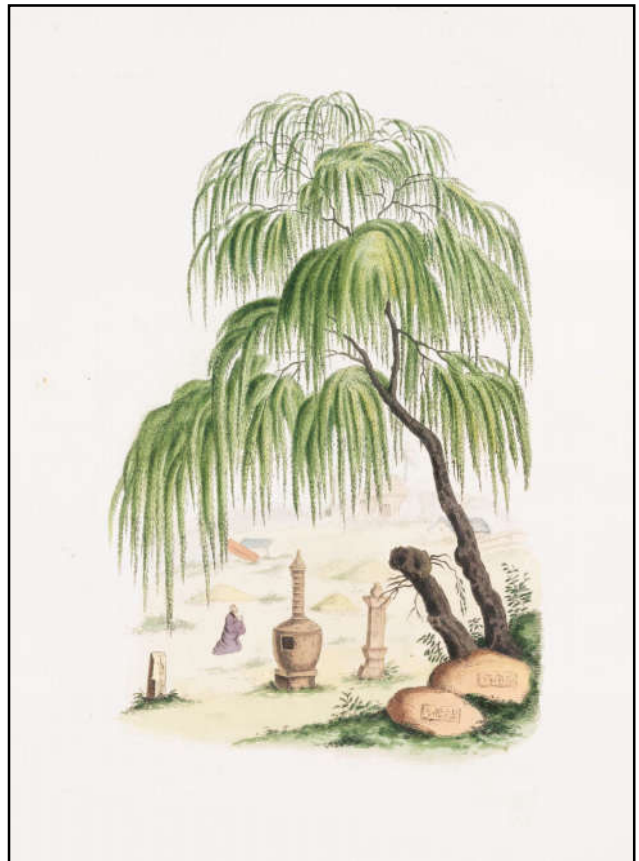
Fig. 24: Bark of *C. austrotibetica*, cultivated, RBG Kew.



Fig. 25: “View of the Tower of the Thundering Winds on the borders of the lake See-Hoo, taken from the valley of tombs.” *Thuja orientalis* on the right and stylised *C. funebris* middle ground left.

Fig. 26: *C. funebris* (as *C. pendula* in Lambert 1803: Plate #43; 1832: Plate #66).

Fig. 27: *Thuja orientalis* ‘Filiformis Pendula’ (as *C. pendula* for instance in Lambert 1832 – cf. Fig. 17).



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Appendix A: *Cupressus* collections from the Parlung Tsangpo drainage

Collections (and herbarium sheets)		Date	Information: <i>label</i> – [updated] – * translated from Chinese – # in litt. – Legend: p. 73.	Altitude m
1	<i>Bailey s.n.</i> E00188327	1913-07-05	Upper part of the Brahmaputra (Tsangpo) . 30°07'20.25"N, 95°02'35.16"E Cypress called TSANDEN - YIGUNG valley - 7500 - 5-7-13 (field label) Paratype of <i>Cupressus austrotibetica</i>	2286
2	<i>Ludlow, Sherriff & Elliot 12130</i> BM000835380 E00182052	1947-01-11	Trulung, Pome, SE Tibet. 6500 ft. ~30°02'21.6"N, 95°00'40.3"E Tree: 50-80 ft. [15-25 m]. Scarce. In dense mixed forest. Paratype of <i>Cupressus austrotibetica</i> Paratype of <i>Cupressus austrotibetica</i>	1980
3	<i>Ludlow, Sherriff & Elliot 12141</i> BM000546888 E00188326 E00182053	1947.01.13	Trulung, Pome, SE Tibet. 7000 ft. Tree up to 200 ft. [61 m.] These magnificent trees appear first near the junction of the Po Tsangpo and Yigrong Chu. They become more numerous further up the river, in mixed forest. Holotype of <i>Cupressus austrotibetica</i> Isotype of <i>Cupressus austrotibetica</i> Isotype of <i>Cupressus austrotibetica</i>	2134
4	<i>Zhong Buqiu 7096</i> PE00053434	1952-00-00	* Xizang, Xikang [formerly Eastern Tibet], Yigong [Yigong Township]	
5	<i>Zhang Yongtian & Lang Kaiyong 857</i> PE00014369 PE00053435	1965-07-22	* Xizang, Bomê County, Tongmai forest, hillside forest. H. 6 m. (translated from the two original labels)	2000
6	<i>Ying Junsheng & Hong Deyuan 650772</i> PE00012995 PE00012996 PE00012997	1965-07-23	* Xizang, Tongmai, Yi'ong river valley, on eastern forest slopes. H. 20 m, brown bark, green leaves, medium brown cones. ~30°05'51"N, 95°03'47"E (+) Hong, D.Y & Yeng, J.S. in the protologue of <i>C. tongmaiensis</i> (Silba 1994) PE00012997 <i>C. torulosa</i> det. L.K.Fu (thinner leafy twigs !), 1971.03.10 <i>C. torulosa</i> det. A.Farjon, 2000.10.03 Lectotype of <i>C. tongmaiensis</i> (<i>C.austrotibetica</i> dét. Silba, 1990.01.31). Cf. p. 56, n. 5. Isolectotype of <i>C. tongmaiensis</i> (<i>C.austrotibetica</i> dét. Silba, 1990.01.31) Isolectotype of <i>C. tongmaiensis</i>	2070
7	<i>Zhang Jingwei & Wang Jinting 0334</i> PE00042979	1966-06-11	* Xizang, Tongmai to Yigong road, roadside. ~30°06'07.66"N, 95°03'55.40"E H. 15-22 m. Round cones, bumpy scales.	2150

8	<i>Xizang team 89</i> PE00026751 PE00026752 PE00042980	1975.11.05	* Xizang, Bomê County (field label PE00026751). Sparse forest, sunny side, by the river. Ø 50 cm. "Only in Xizang, Bomê county, rare, a valuable large tree, good quality wood." (label PE00026751).	2100
9	<i>Qinghai-Xizang Plant Team 11662</i> PE00042978 PE00042933 PE00042932	1976-05-11	* Xizang, Bomê County, Tongmai, on slopes. Tall tree H. 30-40 m. Dominant species.	2000- 2500
10	<i>Anonymous 76-706</i> PE00206265 PE00206266 PE00206267 PE00206268 PE00206269 PE00206270 PE00206271 PE00206272	1976.08.05	* Xizang, Yigong. Tall tree H. 25 m, Ø 70 cm. Brown ripe cones.	2300
11	<i>Wu Zhengyi 5629</i> (as #29 in CVH) KUN0134177	1976-09-08	* Xizang, Bomê County, Tongmai to Yigong. Under secondary evergreen broad-leaved forest, found occasionally. Grass green leaves, with white powdered underside.	2100
12	<i>Wu Zhengyu 5721</i> KUN1224225	1976-09-10	* Xizang, Bomê County, Yigong farm, section 5, near lake, tall tree H. 50 m, more than 1 m Ø. Leaves dark green, cones purple-brown, common at some places.	
13	<i>Guo Benzhaio & Wang Weiyi 23339</i> HNWP68069	1977-08-30	* Xizang, Tongmai to Yigong. H. 10 m.	2200
14	<i>Ren Xianwei * 790028</i> (*according to CVH) BJFC0032036 BJFC0032037 BJFC0032038 BJFC0032039 BJFC0032040 BJFC0032041 BJFC0032042 BJFC0032043 BJFC0032045	1979.03.15	* Xizang, Tongmai.	

15	<i>Anonymous 206</i> NAS00002915 NF1004118	1979-06-00	* Xizang, Yigong [Township]. Alternative reading: N° 902 and 1979.07.00.	
16	<i>Xu Feng xiang 705</i> NF1004121 NF1004122	1979-07-05	* Xizang, Tongmai.	2100
17	<i>Ni Zhicheng et al. 1642</i> PE00014370 PE00014371	1980-09-14	* Xizang, Bomê County, near Tongmai. Tall tree, H. 30-40 m. Cypress forest, slopes.	2150- 2300
18	<i>Ecological bureau plateau group 15521</i> PE00063431	1980-09-15	* Xizang, Bomê County, Tongmai, shaded slope. (Each side of Yangpogou.) [Text is partially unreadable.]	2200- 2400
19	<i>Chéng Shùzhì & Lǐ Bóshēng 03075</i> PE00026749 PE00026755	1982-11-26	* Xizang, Mêdog County, Yarlung Tsangpo, Bangxing township, Gendengcun. Next to the house. Tall tree H. 25 m, D. 40 cm, brown cones. ~29°35'18.3"N 95°23'21.8"E Isolectotype of <i>Cupressus austrotibetica</i> subsp. <i>medogensis</i> Lectotype of <i>Cupressus austrotibetica</i> subsp. <i>medogensis</i>, <i>hic designatus</i>	1560
20	<i>Lǐ Bóshēng & Chéng Shùzhì 01977</i> PE02073229 PE00026756	1982-12-02	* Xizang, Linzhi, Bayi County, Bayu township, from Sokang la [pass] to Bayu. Common at some places, evergreen, broad-leaved forest belt. Tall tree H. 30 m ~29°50'49.73"N, 95°11'22.45"E	2400
21	<i>Lǐ Bóshēng & Chéng Shùzhì 6434</i> PE02073416 PE02073417 PE02073418 PE00026750 PE00026757	1983-08-14	* Xizang, West side of the Yi'ong river, slopes with terraces, on slope or sporadic in small groups. H. 30-60 m, Ø 80-200 cm.	2100- 2600
22	<i>Lǐ Bóshēng & Chéng Shùzhì 6500</i> PE02073231	1983-08-14	* Xizang, West side of the Yi'ong river, on slopes with terraces. Seedlings visible here and there. under the cypress forest. H. 30 m. Note: seedling with juvenile foliage and roots!	2200
23	<i>Xizang Institute of Biology Plant Resources Team 3549</i> XZ0000331	1983-08-14	* Xizang, Bomê County, Yigong township, on the shores of Yigong Hu (lake), cypress forest. H. 30-40 m.	2350

24	Zhang Zongyan s.n. KUN1223664	1985-08-00	* Xizang, Bomê County, Yi'ong, Yarlung Tsangpo river tributary. Deep soil and mild climate. H. 50 m, Ø 120 cm	2000
25	T. Naito & K.Y.Lang 974 PE00026753 PE00026754	1986.05.14	<i>China, Tibet, Bomi Xian: Tangmai.</i> <i>On rocky slope. Up to 30 m high.</i>	~2000
26	Tang Gengguo 402 NAS00003188 NF1004117 NF1004118	1989-07-20	* Xizang, Linzhi, from Dongjiu to Tongmai, roads station 104. [This station is at Pailongcun.] 30° 2'33.68"N, 95° 0'36.37"E	
27	R.Businsky 33309 x PR	1992-07-18	# Xizang, Nyingtri [Linzhi] Prefect. & Co., confluence of the rivers Yigong Zangbo [Yi'ong river] (with Polung [Parlung] river branch from the E) and Lang Ho [Layue Qu], ca 10 km SW of Tengmai [Tongmai]. At road on foot of SE ridge; tree: approx. 40 m h., seed cones 1.3–1.7 cm long; 30°01'40"N, 95°00'50"E.	2000
27b	R.Businsky 33608 B10047898	1992-07-18	Same locality information as <i>R.Businsky 33309</i> , except 30°02'N, 95°01'E and altitude: <i>Cupressus tongmaiensis</i> det. J.Silba, 2013-03-21. (Alternate reading: <i>R.Businsky 33308</i> .)	2050
28	Sun Hang, Zhou Zhekun, Yu Hongyuan 5032 KUN0134271	1993-05-22	* Mêdog County. [Gedangxiang, ~29°26'17.1"N, 95°40'11.2"E] Paratype of <i>Cupressus austrotibetica</i> subsp. <i>medogensis</i>	2200
29	R.Businsky 43301 PR	1996-07-05	# Xizang, Nyingtri [Linzhi] Prefect., Nyingtri & Bomi [Bomê] Co. boundary, Yigong Zangbo [Yi'ong river] valley appr. 1 km SW of the bridge across the river near Tangmai, foot of wooded E slopes on right riverside at road No. 318; 30°06'00"N, 95°03'30"E.	2100
30	K.Rusforth KR5528 E00127493	1997-10-16	China: Xizang (Tibet) Aut. Reg.: Pome [Bomê], Yigrong [Yi'ong] Tsangpo, up river from station 62. 30°01'45.4"N, 95°00'55.3"E. <i>Trees to 40 m, slender spire-like crown, stout trunks.</i>	2100
31	K.Rusforth KR5768	1997-10-20	Bomê, near the confluence of the Parlung Tsangpo and the Tongkyuk chu [Peilong Gongzhi], near station 62 at 30°01'44.4"N, 95°00'39.3"E ; trees to 30 m on hillside above, cuttings from 4 seedlings.	2100
32	K.Rusforth KR6305	1999-10-10	Parlung Tsangpo above station 31 (30°02'14.9"N, 95°00'42.1"E) and below the confluence at Tongmai (station 240 at c. 30°05'50.5"N, 95°03'58.8"E); seedlings from bank	c. 2030
33	K.Rusforth KR6015 , clones A & B	1999-10-02	# Xizang, Po [Parlung] Tsangpo above the confluence at Tongmai. 30°06'07.16"N, 95°06'15.41"E Two trees growing at edge of steep cliff at edge of small side chu on the right bank of the Parlung Tsangpo.	2100

34	<i>K. Rusforth</i> KR7010	2001-07-06	Parlung Tsangpo gorge, between the confluence of the Tongkyuk chu [Peilong Gongzhi] with the Yi'ong and station 235 (30°04'05.0"N, 95°02'32.4"E); seedling.	c. 2040
35	<i>K. Rusforth</i> KR7203	2001-07-14	Parlung Tsangpo gorge between Tongmai (station 240, 30°05'50.5"N, 95°03'58.8"E) and station 235 (30°04'05.0"N, 95°02'32.4"E) at circa 2040 m; seedlings germinating on flood affected side of river.	c. 2040
36	<i>T. Baxter</i> s.n.	2005-00-00	Ness NG, Liverpool, England. Cultivated , from seed of 6015, clone B.	
x	LIV-2005.15.2873		Holotype of <i>Cupressus rushforthii</i> (cf. p. 57)	
37	<i>K. Rusforth</i> KR5528 E00705886 E00705887 E00705888	2009-01-29	XBI Birr Castle, Irland. Cultivated , from seeds KR5528.	
38	<i>Zhāxīcǐrén & Xīluò</i> , # <i>Zhong</i> Y664 KUN1405168	2009-09-14	* Xizang, Linzhi, Bomê County, 30°07'09.4"N, 95°01'26.3"E. Mixed coniferous and broad-leaved forest, river valley; erect plant. H. 50 m ["cm"].	2102
39	<i>Lars & Miehe</i> LO-04-74 & 04-74-01	2010-00-00	# Xizang, Tongmai. 30°01'40.2"N, 95°16'45.0"E. in Xu <i>et al.</i> 2010. <i>C. rushforthii</i> ?	2600
40	<i>Sabine Miehe</i> 07-038-01	2010-00-00	# Xizang, Yigong. 30°08'26.4"N, 95°01'03.0"E. in Xu <i>et al.</i> 2010.	2152
41	<i>Jianquan Liu</i>	2010-00-00	# Xizang, Yigong. 30°01'00.0"N, 94°58'00.0"E (coord. don't correspond to locality). in Xu <i>et al.</i> 2010.	2300
42	<i>Zhaxiciren</i> ,	2010-00-00	# Xizang, Bomê. 30°08'22.8"N 95°01'02.4"E. in Xu <i>et al.</i> 2010.	2400
43	<i>Tian Xinmin, Wang Zhiqiang, Zou Jiabin, LiuJQ-Txm10-199</i> KUN1405167 HNWP00001975	2010-08-30	# Xizang, Linzhi, Bomê County, Yigong township, Tongmai. Valley forest, arbor. 30°08'05.8"N, 95°01'05.6"E (label)	2102
44	<i>Mao Kangshan, Ren Guangpeng, Zou Jiabin LiuJQ-QTP-2011-205</i> KUN1405166 x HNWP0283242 x HNWP0283243	2011-10-02	* Xizang, Linzhi, Bomê County, Yigong Township. Temperate arid hillside, arbor. 30°16'35.7"N, 94°48'55.1"E (label)	2228

45	<i>Hu Jun, Xiong Yuning, Chen Qingheng, Wang Dongchao HJ05479</i> NAS00593240 NAS00593241 NAS00593242 NAS00593243 NAS00593244	2015-10-11	* Xizang, Linzhi County, Tongmai to Yigong Hu (lake). Hillside, forest, arbor.	2300
46	<i>Hu Jun, Xiong Yuning, Wu Xiaogang, Wang Dongchao HJ04902</i> NAS00593235 NAS00593236	2015-10-27	* Xizang, Linzhi County, Tongmai to Yigong, near the Yigong Tea plantation camp in Bomê County. Hillside Tibetan cypress forest, arbor.	2200
47	<i>N.Nagalingum 17-195</i> FLAS267936	2017-06-08	<i>Cultivated plants of Florida, Cupressus torulosa D.Don. Miami-Dade County; Coral Gables.Montgomery Botanical Center; 11901 Old Cutler Rd. Coral Gables. Collected as Cupressus austrotibetica, Montgomery accession: 2013-0230*B. Collected in bed: RATN-P1. Originally collected by Po Tsangpo in China, south-east Tibet, Trulung, Pome, collected near Yigrong Chu River by Po Tsangpo.</i>	1900
48	<i>Fu et al.</i>	2019-02-21	# Tongmai, Bomi Xian [Bomê County]. 30°06'41.10"N, 95°04'13.70"E	2059
49	<i>Fu et al.</i>	2019-02-21	# Yigong, Bomi Xian [Bomê County]. 30°08'1.70"N, 95°01'8.90"E	2115
50	<i>Fu et al.</i>	2019-02-21	# Yigong, Bomi Xian [Bomê County]. 30°10'47.90"N, 94°54'30.40"E	2282

Legend:

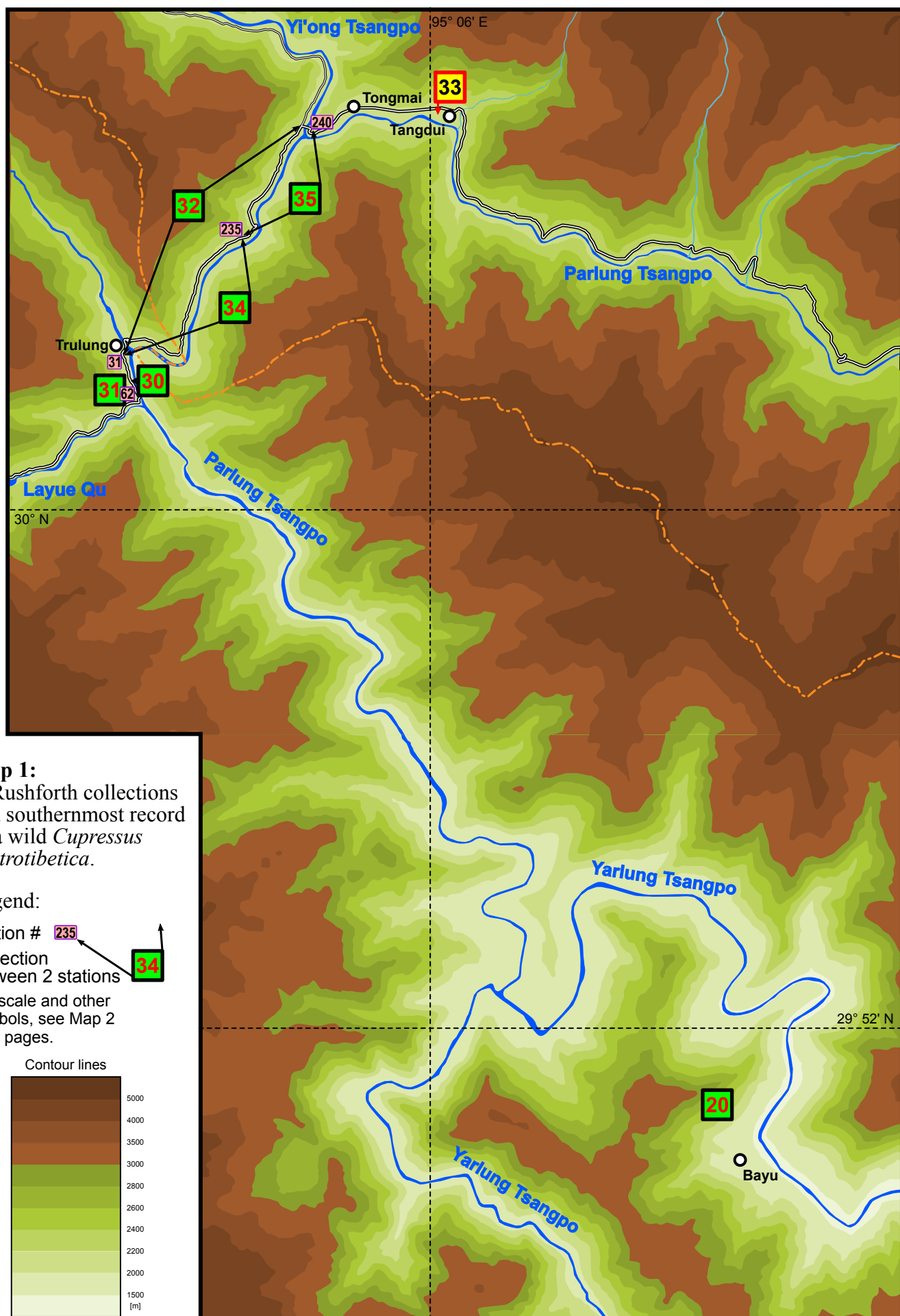
31	Collection data, <i>C. austrotibetica</i> .
33	Collection data, <i>C. rushforthii</i> .
37	Data from a research article.
19	Cultivated
28	Doubtful specimen
x	No photo available

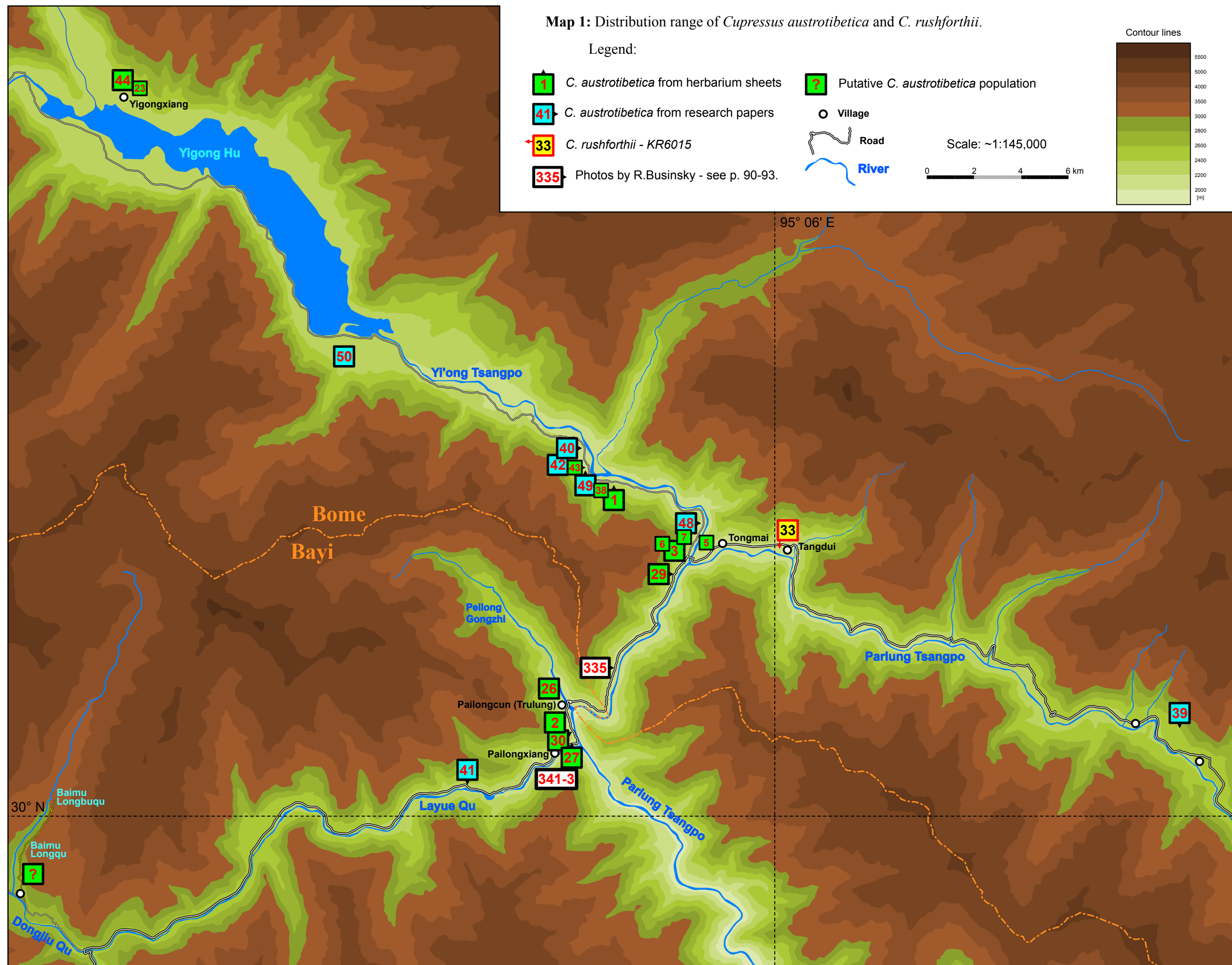
Cells with green, yellow or blue colour: locality present on the map 1 or 2.

Cells without colour: exact locality unknown.

Appendix B: Taxonomy of *Cupressus* species from the Yarlung Tsangpo basin, Xizang (Tibet), China.

Taxa		Type	Type locality
<i>Cupressus gigantea</i> W.C.Cheng & L.K.Fu	1975	<i>Qinghai-Xizang plant team 3318</i>	Nang County, Yarlung valley, c. 3100 m.
≡ <i>C. torulosa</i> var. <i>gigantea</i> (W.C.Cheng & L.K.Fu) Farjon	2005		
synonyms			> c. 10 km. <
= <i>Cupressus tongmaiensis</i> var. <i>ludlowii</i> Silba	1994	<i>Ludlow, Sherriff & Elliot 13345</i>	Nang County, Yarlung valley, c. 3100 m.
= <i>Cupressus gigantea</i> subsp. <i>ludlowii</i> (Silba) Silba	2005		
<i>Cupressus austrotibetica</i> Silba	1988	<i>Ludlow, Sherriff & Elliot 12141</i>	Bomê County, Parlung valley, 2130 m.
≡ <i>C. duclouxiana</i> subsp. <i>austrotibetica</i> (Silba) Silba	2005		
synonyms			> c. 9 km. <
= <i>Cupressus tongmaiensis</i> Silba	1994	<i>Ying Junsheng & Hong Deyuan 650772</i>	Bomê County, Yi'ong/Parlung junction, 2070 m.
= <i>Cupressus gigantea</i> subsp. <i>tongmaiensis</i> (Silba) Silba	2005		
= <i>Cupressus austrotibetica</i> subsp. <i>tongmaiensis</i> (Silba) Silba	2013		
= <i>Cupressus austrotibetica</i> subsp. <i>medogensis</i> Silba	2013		
<i>Cheng Shuzhi, Li Bosheng 03075</i>			Cultivated, Mêdog County, 1560 m.
<i>Cupressus rushforthii</i> Maerki & J.Hoch	2021	<i>T.Baxter s.n.</i> from <i>K.Rushforth 6015B</i>	Cult. from Wild, Ness BG, S.Wirral, UK. E. of Tongmai, Parlung Tsangpo, 2100 m.





Appendix C : Treatment of *C. austrotibetica* by Farjon.

It has already been discussed that Farjon makes no distinction between *C. torulosa* and *C. austrotibetica*, synonymising the latter with the former (Maerki 2016).¹ This confusion bypasses all the morphological observations (D.P. Little, K. Rushforth and botanists who visited the Parlung Tsangpo area) and molecular analyses (see Xu *et al.* 2010, Fu *et al.* 2019), not to mention the geographic distance between the two species separated by the highest mountain range. Farjon in his online database (used for the publication of his *World Atlas of Conifers* [Farjon & Filer 2013]) lists eleven specimens² within the Parlung Tsangpo drainage area (see List 1). The associated map is reproduced here as Map 4, p. 81. The reference numbers on the map are added according to List 1 below.

List 1: *Cupressus* specimens recorded by Farjon as coming from the East Xizang region. Records are taken from the public database website: [BRAHMS: Conifers of the World – University of Oxford](https://www.brahmshs.org/) (accessed 2021-06-07).

1. **Cupressaceae *Cupressus torulosa* var. *torulosa* D. Don**, Collector: **Bailey, FM**, Coll. No. s.n., Y-M-D: 1913-00-00, Lat: 30,1666666667, Lon: 94,9666666667, Alt: 2286, **China**; Xizang (Tibet); Bomi Xian; Yigong Nongchang; ["Yigong"].
2. **Cupressaceae *Cupressus torulosa* var. *torulosa* D. Don**, Collector: **Ludlow, F** with Sherriff, G, Coll. No. 12141, Y-M-D: 1947-01-13, Lat: 29,9666666667, Lon: 94,8500000000, **China**; Xizang (Tibet); Linzhi Xian; Dongjiu; ["Trulung"].
3. **a. Cupressaceae *Cupressus torulosa* var. *torulosa* D. Don**, Collector: **Hong, DY** with Yeng, JS, Coll. No. 650772, Y-M-D: 1950-00-00, Lat: 30,1333333333, Lon: 95,1333333333, Alt: 2070, **China**; Xizang (Tibet); Yi'ong River; Tangmai.
b. Cupressaceae *Cupressus torulosa* var. *torulosa* D. Don, Collector: **Ying, TS**, Coll. No. 772, Y-M-D: 1965-07-23, Lat: 30,1333333333, Lon: 95,1333333333, Alt: 2070, **China**; Xizang (Tibet); Yi'ong River; Tangmai.
c. Cupressaceae *Cupressus torulosa* var. *torulosa* D. Don, Collector: **Naito, T**, Coll. No. 974, Y-M-D: 1986-05-14, Lat: 30,1333333333, Lon: 95,1333333333, Alt: 2000, **China**; Xizang (Tibet); Yi'ong River; Tangmai.
4. **Cupressaceae *Cupressus torulosa* var. *torulosa* D. Don**, Collector: **Wu, ZY**, Coll. No. 5721, Y-M-D: 1976-09-10, Lat: 30,3333333333, Lon: 94,9166666667, **China**; Xizang (Tibet); Yi'ong River; Yi'ong.
5. **Cupressaceae *Cupressus torulosa* var. *torulosa* D. Don**, Collector: **Cheng, SZ** with Li, BS, Coll. No. 3075, Y-M-D: 1982-11-26, Lat: 29,6166666667, Lon: 95,4166666667, Alt: 1560, **China**; Xizang (Tibet); Jilong Xian; Bangxing.
6. **Cupressaceae *Cupressus torulosa* var. *torulosa* D. Don**, Collector: **Cheng, SZ** with Li, BS, Coll. No. 6434, Y-M-D: 1983-08-14, Lat: 30,2333333333, Lon: 94,5166666667, Alt: 2600, **China**; Xizang (Tibet); Linzhi Xian; Yigong Cuo; on N shore of lake.
7. **Cupressaceae *Cupressus torulosa* var. *torulosa* D. Don**, Collector: **Rushforth, KD**, Coll. No. 5528A, Y-M-D: 1997-10-16, Lat: 29,8000000000, Lon: 95,7000000000, Alt: 2100, **China**; Xizang (Tibet); Nyinchi; Bomi Xian; ["Yigong Tsangpo, up river from station 62"].
8. **Cupressaceae *Cupressus torulosa* var. *gigantea* (W. C. Cheng & L.K. Fu) Farjon Monogr. Cupressaceae & Sciadopitys: 224. 2005.(2005)**, Collector: **Cheng, NZ**, Coll. No. 1753, Y-M-D: 1980-09-20, Lat: 29,9666666667, Lon: 96,0666666667, Alt: 3100, **China**; Xizang (Tibet); Lingza; ["Ling-zhi Xian"].
9. **Cupressaceae *Cupressus torulosa* var. *gigantea* (W. C. Cheng & L.K. Fu) Farjon Monogr. Cupressaceae & Sciadopitys: 224. 2005.(2005)**, Collector: **leg. ign.**, Coll. No. 15723, Y-M-D: 1980-09-20, Lat: 30,2833333333, Lon: 94,6666666667, Alt: 3100, **China**; Xizang (Tibet); Yarlung Zangbo River; Linzhi.

¹ It is also necessary to remember that Farjon confuses some specimens of *C. lusitanica* cultivated or naturalised in Asia with other Asiatic *Cupressus* species.

² In fact there are only ten different specimens, as a further mistake leads to listing one specimen twice (cf. 3a & 3b) with different dates and collection numbers.

Medog: Cupressaceae *Cupressus torulosa* var. *torulosa* D. Don, Collector: **Sun, H** with Zhou, ZK, Coll. No. ETM5032, Y-M-D: 1993-03-22, Lat: 29,3166666667, Lon: 95,3166666667, Alt: 2200, **China**; Xizang (Tibet); Medog Xian; Gedang.

Of the eleven specimens two are *C. gigantea* (as *C. torulosa* var. *gigantea*³) and do not belong to this area.

The first one, *N.Z.Cheng 1753* (cf. Map 3, #8) belongs to the upper Yarlung Tsangpo, the distance between the real locality and the one displayed on the map is some 300 km. Also the map shows an altitude above 4200 m instead of the recorded 3100 m.

The second one, *Anonymous 15723 N.Z.* (cf. Map 3, #9) belongs also to the upper Yarlung Tsangpo; the distance between the real locality and the one displayed on the map is some 200 km. The map shows an altitude below 2800 m instead of the recorded 3100 m.

For the remaining specimens, here are the necessary corrections in supplement of giving them the correct species name of *C. austrotibetica* (numbers according to List 1 and Map. 3).

1. *Bailey s.n.* (Appendix A, #1): the given coordinates are ones of the closest to the real locality where the first collection (under “*Cupressus funebris*”) was done. The distance is only 8.5 km when the altitude is lower than the actual one. Farjon gives the year of the collection, but not the month and the day.
2. *Ludlow, Sherriff & Elliot 12141* (Appendix A, #3): the name of Elliot is not mentioned. Here the distance from the real locality is above 24 km and in the wrong valley (Layue Qu instead of the Parlung Tsangpo close to the Yi’ong Tsangpo confluence). Altitude above 2700 m instead of the 2130 m given by the collectors. There is confusion of the names as Trulung and Dongjiu are two different localities.
3. Under this number with the exact same coordinates are listed three collections, when **a.** and **b.** are the same one:
 - a.** *Ying Junsheng & Hong Deyuan 650772* (Appendix A, #6): the collection date (1950-00-00) is wrong. Farjon’s coordinates give an altitude of 4290 m instead of the recorded one of 2070 m and place the locality away from the Yi’ong river valley (label: “Tongmai, Yigong river valley, eastern forest slopes”). Worth mentioning is the fact that two of these herbarium sheets were chosen by Silba as type of his *C. tongmaiensis*.
 - b.** *Ying Junsheng & Hong Deyuan 650772* (Appendix A, #6): the second collector is not mentioned and the number of the collection is not complete (“772”). The collection date is correct, otherwise, as for #3a.
 - c.** *T. Naito & K.Y.Lang 974* (Appendix A, #25): the second collector is not mentioned. It is impossible to locate this collection with precision. The coordinates given by Farjon are at an altitude of 4290 m instead of the recorded one of c. 2000 m, on a rocky slope.
4. *Wu Zhengyu 5721* (Appendix A, #12): the label mentions that the collection was done near the lake which is c. 2400 m. Farjon’s coordinates imply an altitude over 5000 m.
5. *Chéng Shùzhì & Lǐ Bóshēng 03075* (Appendix A, #19): the closest coordinates to the real locality, only 4 km to the village where the tree was probably planted (“close to a house”), but 2040 m instead of 1560 m. On Google Earth, Farjon’s coordinates point to the wikipedia entry for [Bangxing](#).
6. *Lǐ Bóshēng & Chéng Shùzhì 6434* (Appendix A, #21): it is again not possible to locate this collection with precision, except that it happened on the West side of the Yi’ong Tsangpo between 2100 and 2600 m and not on the North side of the lake at 2600 m. Farjon’s coordinates show an altitude of 4800 m.
7. *K.Rusforth KR5528* (Appendix A, #30): here there is a distance of more than 70 km between the given coordinates and the real locality and the altitude difference amounts to 1500 m.

³ Another error, for treating *C. gigantea* as a variety, two combinations have priority over Farjon’s one: *C. torulosa* var. *majestica* Carrière and *C. tongmaiensis* var. *ludlowii* Silba (this last one pointed by Rushforth).

Also worth mentioning is *Sun Hang, Zhou Zhekun, Yu Hongyuan 5032* (Appendix A, #28 – south of map 3, cf. below Fig. 1) which was identified by Farjon as *C. torulosa* [label: “Det. A. Farjon (RBG Kew) 2000.09.05”], and by Silba as *C. austrotibetica* subsp. *medogensis* (paratype!). There is no reason to discard the collectors original identification of this specimen as *Platycladus orientalis*, which it fits on morphology. Moreover the locality is again misplaced along the Yarlung Tsangpo (29.316666667, 95.316666667) instead of the Chimdro Chu. Distance difference: 36 km; altitude difference close to 1.000 m. The third collector is omitted by Farjon.

While examining closely the data provided by Farjon, the number of mistakes and confusions impacts seriously a taxonomy which – at least for the genus *Cupressus* – becomes arbitrary and unscientific. Moreover this leads to serious conservation issues, especially when considering the failures to identify correctly several critically endangered cypress taxa. The limit of Farjon’s expertise is shown further by his incapacity to locate the type of *C. torulosa* (cf. Maerki 2021).

In his monograph on *C. torulosa*, Farjon (2013: 166) states:

“The Himalayan Cypress, *Cupressus torulosa* D. Don, has a disjunct distribution, with two main areas: the western Himalaya from Himachal Pradesh (Chamba District) to West-Central Nepal (Mustang District) and East Xizang (Tibet) in the lower Yarlung Zangbo Valley and tributaries from the north, from near Gyangze downstream to Bomi on the Nagong River.”

Gyangze is in Central Xizang while the Nagong River is recorded nowhere.

(Appendix F – continued from p. 89.)

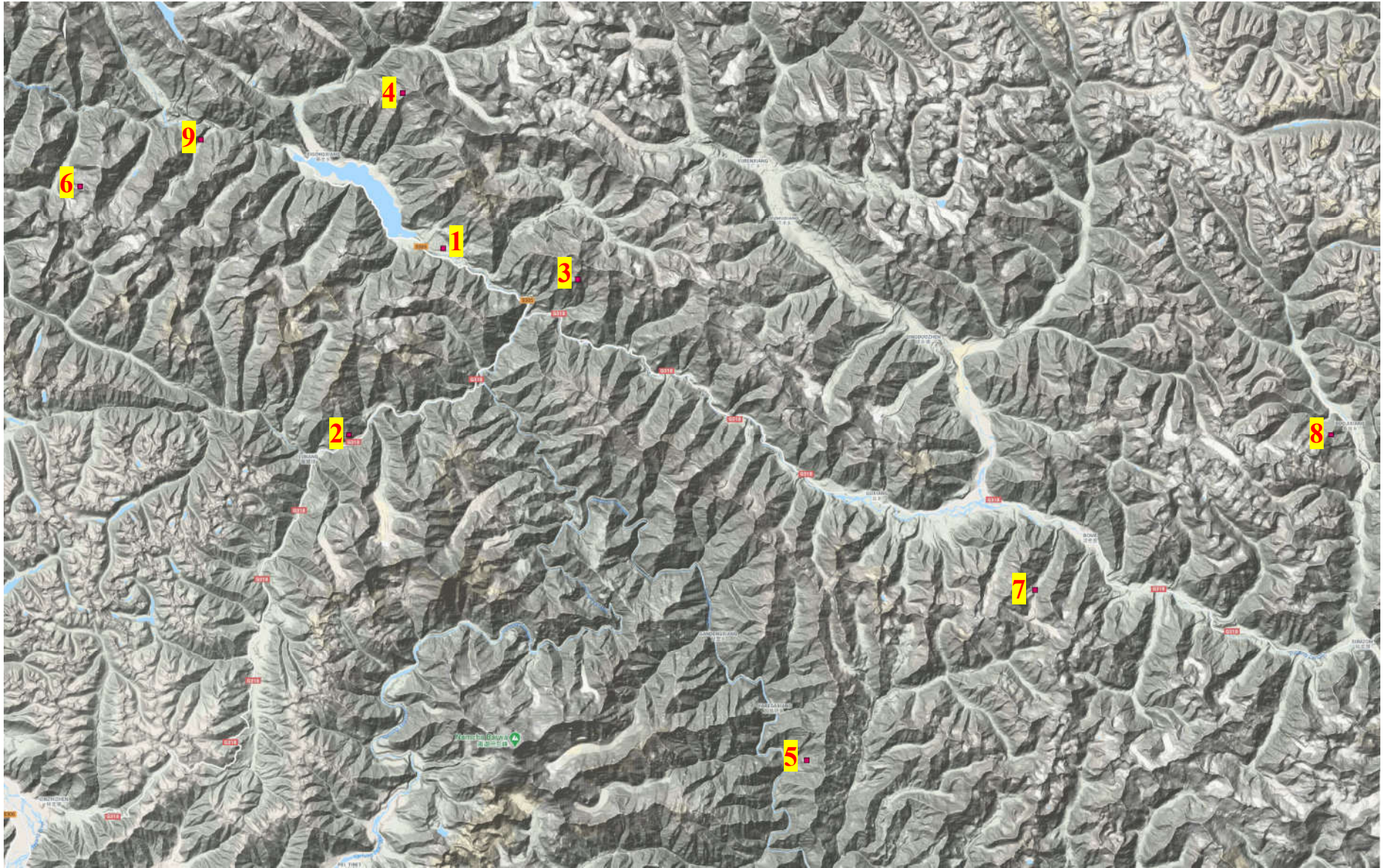


Fig. 13: Holotype of *C. tonkinensis* ([NY00329218](#)). Eberhardt 5073, no date, Kai Kinh, Langson [Tonkin], Vietnam.

Farjon’s annotations:

“*Cupressus torulosa* D. Don / (identity ± uncertain, introduced) / Det. A. Farjon (RBG Kew) Nov 2000”

“Holotype of: / *Cupressus tonkinensis* Silba / J. Int. Conif. Preserv. Soc. 1(1); 23 (1994). / = *Cupressus* cf. *lusitanica* (probably orig-/ inally introduced) A. Farjon Aug 2002.”



Map 4: *Cupressus* specimens listed in Farjon's online database, Bomi and Bayi County area. The numbers refer to List 1 (p. 78).

Appendix D: The discovery of *C. austrotibetica*.

Although *Cupressus austrotibetica* was discovered at the beginning of the 20th century, it took 75 years to recognise it as a separate species. Bailey did not try to identify it by a Latin name and mentioned only the local name (“Tsanden”, which is an homonym of the vernacular name of the Bhutan Cypress [Tsenden], although both species are separated by a mountain range, but from the same Tibetan culture), the altitude in feet and the date, which was corrected from 4 to 5 July, corresponding to the report published the next year (cf. Fig. 1). At Edinburgh it was first attributed to *C. funebris*. Then this first identification was stricken and M. Y. Orr determined it at an unknown date as *C. torulosa*, another Himalayan species, but more than one thousand kilometres to the west of Eastern Xizang where *C. austrotibetica* is growing. A second expedition in 1941 led by Ludlow, Sherriff and Elliot brought more material (cf. Appendix A, #2 & 3) and were determined as *C. duclouxiana* by Franco (1968). In 1982 Silba agreed with Franco’s determination as *C. duclouxiana* (despite the cones not fitting!) before he described it as a new species in 1988. Finally, Bailey’s sample was chosen as a paratype of *austrotibetica* by Silba. Rushforth and Little confirmed the new species identity. See p. 83 the successive labels attached to this historical sample, followed by Ludlow report visiting Trulung, published in 1957.

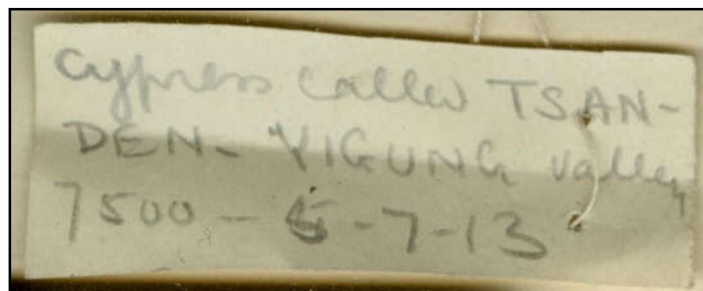


Fig. 1: First label likely established by Bailey and attached to the sample.

Here is the report by Bailey (1914: 51) about the tree discovery. It allows confirming the date and the precise locality where this first sample was collected (our emphasis). See Bailey’s map extract p. 85.

3rd July, Dre.—We halted to-day while Captain Morshead mapped the upper end of the lake. In the evening after dark, Penzog Rapden asked me to speak to him privately. He thought that we had some ulterior object in our journey which was connected with the Chinese, and he thought that I would perhaps take him into my confidence if no one else were present. We noticed two varieties of pine growing there, *Pinus densiflora* and *P. excelsa*.

4th July, Sangyü, 8 miles, 7,250 feet.—We travelled down the right bank of the river and camped under a large **cypress tree** nearly two miles below the village of Sangyü or Sangdzong as it is sometimes called. On the road we crossed one large stream, the Tawan, by a fallen tree. A few drops of rain.

5th July, Chuluk, 9½ miles, 6,850 feet.—Seven miles from camp we had a steady climb of 1,000 feet. At the foot of this spur was the site of a village which had been destroyed by the Yigrong flood which was 170 feet above the present level of the water. We camped at the junction of the Po and Yigrong rivers opposite to Tang me. The width of the combined rivers here was found by Captain Morshead, who measured it, to be 280 yards. We heard that the Abor Survey Party were expected in Pe in a day or two. A few showers with a good deal of sunshine.

6th July, Trulung, 104 miles, 6,450 feet.—The road was down the bank of the Po Tsangpo through forest most of the way ; two spurs had to be crossed which necessitated steep climbs of 800 and 1,000 feet. Ten miles from camp we reached the Trulung Chu, which we crossed by a bridge, half a mile beyond which we camped at the junction of the Trulung and Po rivers. The village of Trulung formerly stood above the bridge but had been destroyed by the Chinese. We had hoped to go down the Po Tsangpo to its junction with the Tsangpo and Gompone, but there is no road on the right bank and the rope bridge which leads to the left bank has been carried away by floods. We were shown the sites of two rope bridges one above and one below the confluence of the two rivers. Our camp is on the site of the camp which was occupied by the Poba soldiers the day before they fought the Chinese on the Chabji La. Trulung is the same as Kinthup’s “Poh-Toi-Lung”. Heavy rain in the morning.

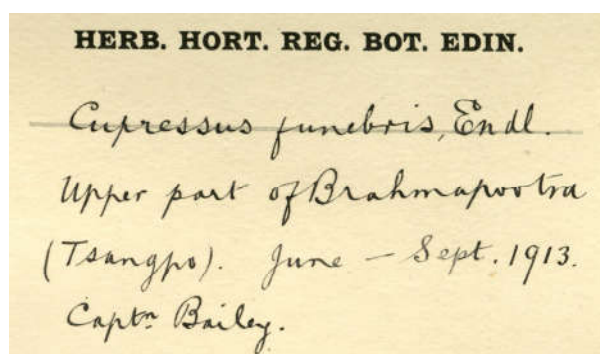


Fig. 2: Second label attached to *F.M. Bailey s.n.*



Fig. 3: Apparition of the too famous *C. torulosa*.

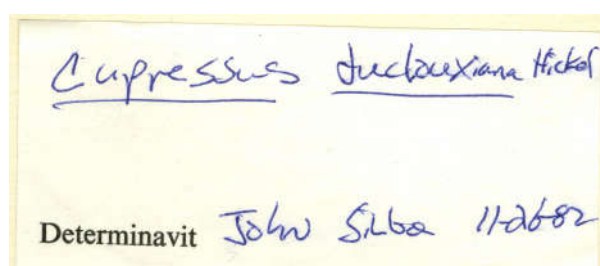


Fig. 4: Another erroneous identification (1982).

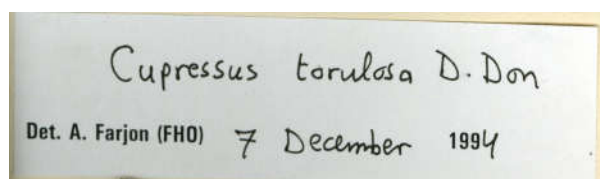


Fig. 5: Without further comment.

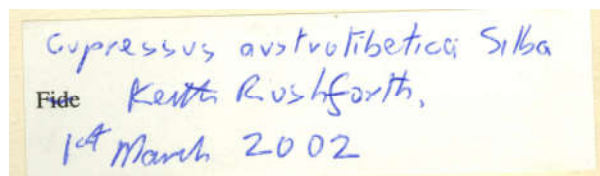


Fig. 6: Confirmation as a valid species.

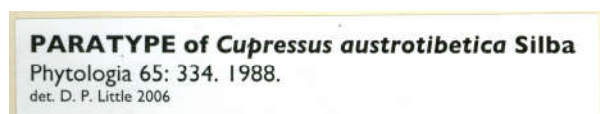


Fig. 7: Finally mention of the paratype.

Gardeners Chronicle Gardening Illustrated, October 26, 1957

PLANT HUNTING

The Gorges of the Tsangpo: 3

By F. LUDLOW

THE last day's march into Trulung was a tiring one and when I reached camp I attributed my exhaustion to the difficulties of the road. As time passed, however,

my *malaise* increased. I felt cold and giddy, and had a curious numbing pain at the back of my neck, and could neither see nor write properly. Eventually I lay down on my bed, as I was unable to stand, and sent my servant for Elliot, but he came back a few minutes later to say that the "Doctor Sahib" was also unwell. After a few minutes, however, Elliot gallantly struggled across to my tent, accompanied by Sherriff, who quickly summed up the situation and sent both of us supper-less to bed.

Next morning we had completely recovered and the topic of conversation at the breakfast table naturally turned to our indisposition of the previous evening. Elliot now began to suspect that we had been poisoned by the honey we had eaten, although Sherriff found difficulty in accepting this theory as he also had eaten the honey and had been unaffected. Orders, however, were issued for the honey to be thrown away. A few hours later Elliot's suspicions were confirmed in a most convincing manner, for one of our Nepali cooks, being reluctant to waste good food, disobeyed instructions, ate a large quantity of the honey, and was in due course assailed by symptoms similar to, but more severe, than those which had afflicted Elliot and myself. There can be no doubt that the honey was the root cause of all the trouble, although it is difficult to account for Sherriff's immunity, except on the assumption that, like the curate's egg, the honey was good in parts.

The local Pobas, whom we consulted on this matter, asserted that wild honey was occasionally poisonous and added that honey deposited on rocks in the spring of the year was particularly dangerous. It is impossible to say what plant, or plants, are responsible for this honey, but a species of rhododendron is likely to be the cause.

Xenophon's account of the poisoning of troops during the retreat of the "Ten Thousand" is generally attributed to the consumption of honey derived from *Rhododendron ponticum*, but this species, of course, occurs nowhere in the Himalayas.

Bees are particularly abundant in Pome and they must be a hardy race, for swarms

were encountered at 9,000 ft. with the thermometer registering 20 degrees of frost. They also appear to be a vicious species, for on a warm afternoon in March, on our return journey, we were suddenly attacked by a swarm and had to flee to our tents for shelter. On this occasion my Labrador was stung so severely that he became paralysed and had to be carried to my tent, where he lay in a critical condition for some time.

Trulung is an insignificant village of a few houses at the junction of the Tongyuk river with the Po Tsangpo at an altitude of 6,500 ft. On a spur, 1,000 ft. above the village, grew *Rhododendron sino-nuttallii*, a plant of unsurpassed loveliness and fragrance. Another rhododendron of great beauty belonging to the same "Maddenii" series was *R. scopulorum*. But the pride of the Po Tsangpo in early spring is the carmine cherry (*Prunus cerasoides* var. *rubra*), a tree which here grows to a height of 100 ft. and is covered in blossoms that can be seen on the hillsides a mile distant.

One march beyond Trulung brought us to an encampment opposite the village of Tangme, where the Po Yigrong and Po Tsangpo meet, and here on a spur overlooking the junction grew specimens of *Cupressus torulosa* which exceeded in size any trees I have seen in the Himalayas. One trunk we measured was 36 ft. in girth at 5 ft. from the ground, and we estimated its height at over 200 ft. These monarchs grew sparingly, but such was their magnificence that they were discernible from afar, towering aloft above the heads of all their rivals.

A rope bridge spans the Po Yigrong, just above the Tangme junction, but we did not cross it, and marched up the right bank of the river for two days until we came to the Yigrong Lake.

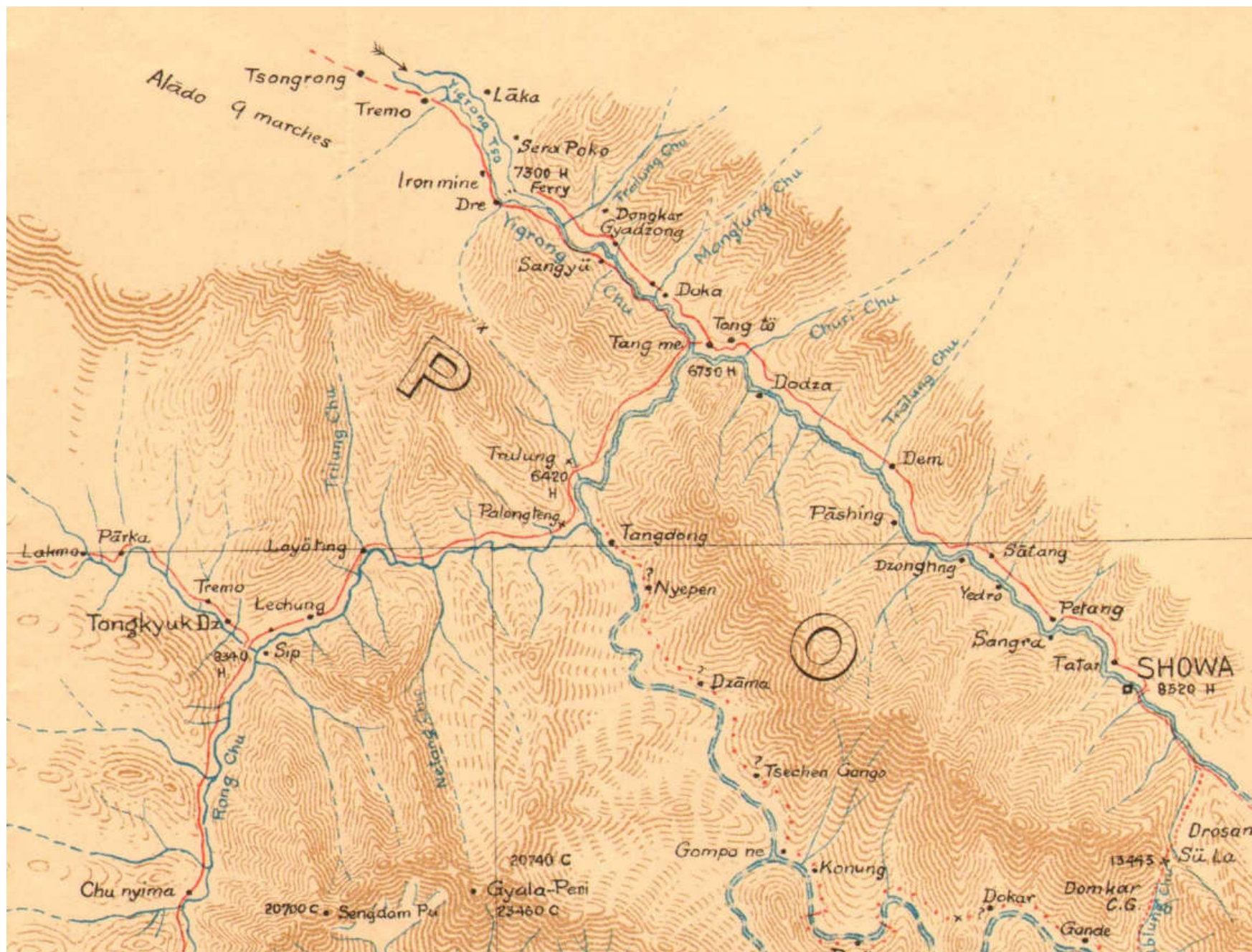
This lake originated half a century ago when a small tributary of the Yigrong, called the Tralung Chu, suddenly began to discharge great quantities of mud and boulders into the river. This great rock-slide entered the Yigrong at a narrow part of its

course and formed a dam 350 ft. high which held up the waters of the river for over a month. A lake many miles long was formed above the dam, which collapsed as soon as it was overtopped by the impounded waters. The resulting flood swept down the Yigrong and Po Tsangpo Valleys leaving havoc in its train. Low-lying villages and cultivation were obliterated and the effects of the flood were felt even in the plains of Assam, where trees hitherto unrecorded from the Himalaya were left on the banks of the Dihang.

We crossed the lake in a dug-out and descended the left bank of the Yigrong, past the Tralung Chu, to the large scattered village of Gyadzong, where we decided to halt for a month, by which time, we hoped, the early spring flowers would be in bloom. Towards the end of January I decided to visit Showa, the capital of Pome, to investigate its possibilities as a collecting centre.

Leaving Gyadzong on January 28, I descended the Po Yigrong to Tangme where *Rhododendron sino-nuttallii* grew in great profusion, and thence ascended the Po Tsangpo, whose waters were of the clearest bottle-green. There were some lovely deep and silent reaches on this great river, but for the most part it was a boisterous, foaming cataract the whole way to Showa. The difference in the vegetation on the two banks was most marked. The track, which kept entirely to the right bank during the four marches to Showa, passed through thin open forest of oak and pine. There was no snow on this bank, but in the dense conifer forests on the left bank it lay everywhere, descending to within a few hundred feet of the river.

Climatic conditions in the Po Tsangpo Valley at Showa seemed to me similar in all respects to those in the main Tsangpo Valley near Tsela Dzong. Past experience has taught me that the main Himalayan range, with its heavy snowfall and rainfall, supports a far richer flora than the drier ranges to the north, so I had every reason to believe that this Su La range near Showa, which appears to be an extension eastwards of the Main Range, would be a most profitable area.



Map 4:
Preliminary
map,
Showing
routes of
Captains
Bailey and
Morshead,
N.E. Frontier
– 1913.

Extract.

Appendix E: *C. austrotibetica*, conservation issues.

Currently no major threats seem to endanger these populations. Still there could be some worries for the future. When looking at the meteorological data of the last 10 years, there is a four year period when the precipitations were well under average. Since 2018 rainfalls are back to normal. Should these drier seasons come back, the lack of water could have a major impact on this rain forest vegetation. The amount of precipitations is directly linked with the number of rainy days. (The units are given as mm when they should read as cm, as rainfalls below 100 mm would mean desertic conditions. For instance Arabian and Gobi deserts receive 100 mm/year or less.)

Table 1: Monthly and yearly precipitations at Tongmai, with number of days with rain, 2011-2020.

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Average
Yearly prec.	242.96	282.73	307.03	307.56	78.99	74.30	59.22	60.59	426.87	435.78	229.30
January	18.80	10.52	9.78	5.90	4.28	3.30	2.16	1.54	8.13	21.80	8.60
February	13.93	14.06	15.50	15.74	2.57	3.98	4.93	7.02	22.48	23.13	13.10
March	31.52	19.94	37.13	27.59	8.19	5.62	7.81	10.50	38.03	42.28	23.10
April	29.92	27.93	29.03	30.34	14.35	10.94	10.41	7.34	22.05	54.45	23.60
Mai	20.01	14.55	35.82	28.68	6.52	10.96	8.78	7.15	31.10	56.70	22.30
June	16.73	22.08	27.91	37.69	4.05	12.51	7.10	1.64	29.50	36.93	19.50
July	26.34	43.08	47.18	44.99	10.78	13.06	4.57	3.04	105.63	60.28	34.30
August	34.81	50.42	37.61	64.74	11.93	3.19	3.52	5.50	68.98	38.93	32.60
September	24.42	43.40	29.74	25.66	6.93	5.23	2.53	3.59	50.53	57.85	24.20
October	11.04	16.96	25.64	8.67	4.32	3.66	4.63	5.02	23.93	17.10	12.30
November	9.72	9.61	4.36	9.03	1.23	0.27	2.09	5.23	15.88	18.38	8.60
December	5.72	10.18	7.33	8.53	3.64	1.58	0.69	2.99	10.63	7.95	7.10
Nb days w. rain	149	164	147	162	116	116	105	118	288	255	162

Source (accessed on 2021.01.20).

Another issue is the government project to build dams. So far there is no such project hitting directly any of the *C. austrotibetica* populations, but the whole area of the Parlung Tsangpo is still under study. According to the legend of the following map, the beige areas are “under Preliminary Analysis for Hydropower Development. Three HPPs [Hydro-Power Projects] have been identified for the Pharlung-Yiwong watershed and more are expected in the next few years. The Great Bend region has no HPPs announced, but several major projects have been discussed, including the three indicated on the map.” Should a project impact the lower Yi’ong valley, most of the lowest populations of *C. austrotibetica* would be under water. However, the populations of *C. austrotibetica* occur on ridges running down the hillsides and thus the trees at risk of flooding are those towards the bottom of the slope (see page 59)¹. A dam drowning the Parlung Tsangpo valley between Trulung and Tongmai is not likely, when it would drown at the same time the main G318 road which has just been enlarged and several tunnels built between those two localities.

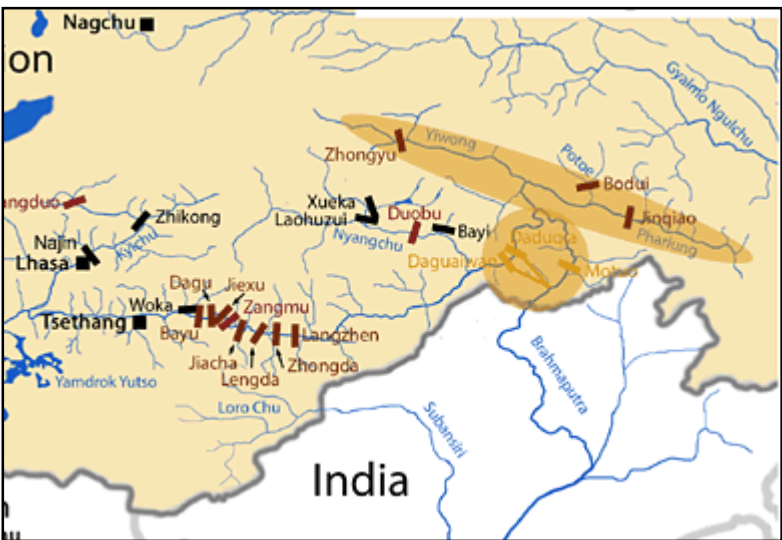


Fig. 1: Hydropower projects and current studies in Xizang.

Notice the dams upstream the main population of *C. gigantea* on the Yarlung Tsangpo. As most trees are growing not far from the river, a change of the water regime could affect them.

Legend:

- / Tunnels/Pipes
- Dam
- City
- Mountain
- River/Lake
- Province
- Country
- Operational/Built
- Under Construction
- Preparation for Construction
- Under Active Consideration
- Preliminary Analysis

¹ The position with *C. gigantea* appears different as due to growing in a drier region more of the species’ population occurs near the highwater mark along the river and comparatively few trees scattered on the hillsides above. Thus a higher proportion of the genepool is at risk from dams.

Appendix F: Is *Cupressus tonkinensis* present in China?

While describing this new species in 1994, Silba mentioned – apart the holotype from Vietnam – as paratypes two collections by *Steward, Chioa & Cheo 10* (A, L) and by *Tsiang 8004* (A) from Guizhou, China. Rushforth wanted to verify these identifications and in his *Notes on the Vietnamese Cupressaceae* (2007: 33), he wrote:

“*Cupressus tonkinensis* can be distinguished from *Cupressus funebris* - on the basis of the limited material available - by the foliage of *C. tonkinensis* being in flattened and sparse fan-shaped sprays and not in the long pendulous sprays which characterise *Cupressus funebris*. Also, the lateral leaves on the Paris isotype have blunt, adpressed tips, not the acute translucent tips to the lateral leaves of *Cupressus funebris*, and the glands on the facial leaves are more pronounced than in typical *Cupressus funebris*. The number of cone scales in *Cupressus funebris* ranges from 6-10, thus straddling the range of *Cupressus tonkinensis*.

Silba has cited two specimens at the Arnold Arboretum from Guizhou, China as belonging to *Cupressus tonkinensis*, viz. Y. Tsiang 8004 and Steward, Chiao & Cheo 10. Through the good offices of the two Curators, I have borrowed these and examined them at Edinburgh; they both fall within the range of *Cupressus funebris* and are not close to *Cupressus tonkinensis*. *Cupressus tonkinensis* is, on our current knowledge, a Vietnamese endemic.”

Our own determinations confirm that the material analysed by Rushforth belongs rightfully to *C. funebris*.

Specimens seen:

- *A.N.Steward, C.Y.Chiao & H.C.Cheo 10*: US01310404, L1187491, NAS00163591, PE00014316, N906008748, N906008771;
- *Y.Tsiang 8004*: E00762418, US01310399, NAS00163616, N906008769, PE00014294.

While the rare *C. vietnamensis* discovered in Vietnam is also found in China, it was worth checking the available material collected in the neighbouring Chinese provinces of Yunnan, Guangxi, Guangdong and Guizhou to see if *C. tonkinensis* also occurs there. None of the numerous herbarium sheets examined showed that *C. tonkinensis* has been collected in China. Thus current evidence still support Rushforth’s conclusion that *C. tonkinensis* is a Vietnamese endemic. It also means that it is the most Critically Endangered *Cupressus* species as it is present in the wild only on a single cliff (Pham Van The *et al.*, 2013). And while it is cultivated in Vietnam, its presence outside its native country is very limited (there are two clones in SW England). *Ex situ* sites should be established urgently allowing documenting its climatic and environmental conditions and limits.

Unfortunately the IUCN following Farjon’s taxonomy does not recognise this taxon as a valid species so that it still has no official international conservation evaluation. Farjon continuously made it a synonym either of *C. torulosa* or *C. lusitanica* as introduced exotic cypresses in Vietnam¹. Farjon’s labels on several herbarium sheets testify how often he confused *C. tonkinensis* with completely different species. Fortunately in addition to several authors², the Royal Botanic Garden of Edinburgh understood that *C. tonkinensis* is a valid species and is critically endangered (CR).

The holotype *P.A.Eberhardt 5073* (**NY00329218** – Fig. 13, p. 80) was chosen by Silba in NY and unfortunately it is a poor specimen; the P isotype (**P00238726** – Fig. 1, p. 88) is not much better except for the presence of two cones. Other old *C. tonkinensis* herbarium specimens are mostly present in the MNHN Herbarium in Paris (P) (Figs 2-9). Their study is quite necessary to understand for instance the unique feature of their branchlets which allows distinguishing this species rather easily from the other *Cupressus* species. More recent collections in Vietnam and from cultivated trees abroad are present in E and NY (Figs 10-12). The available material is reproduced here (pp. 88-89 and 80 [Fig.13]) with links to the original herbarium pages.

¹ Although *C. lusitanica* is indeed present in Vietnam, there is no available record of a *C. torulosa*.

² J. Silba, D.P. Little (2005), K. Rushforth (2007), M.P. Frankis, Terry (2018), etc. To be noted though that the material of Rushforth *et al.* (2003) was not *C. tonkinensis* and clustered with other Mexican cypresses, when some were also introduced in Asia during the colonial period.

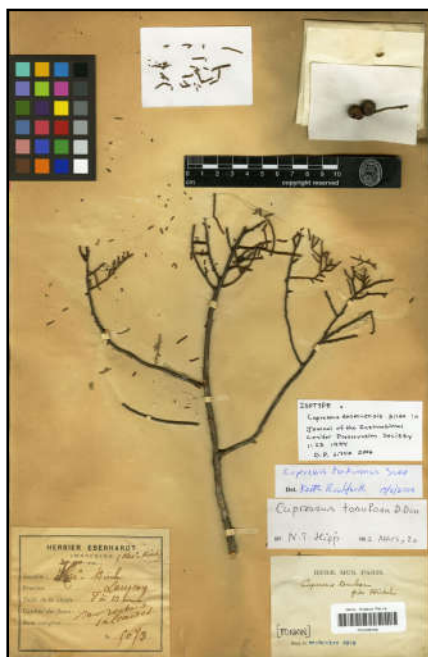


Fig. 1: *C. tonkinensis* ([P00238726](#))



Fig. 2: *C. tonkinensis* ([P06489695](#))



Fig. 3: *C. tonkinensis* ([P06489696](#))

Figs 1 to 9: © Musée National d'Histoire Naturelle - Paris. Figs 10 & 11: © NY Herbarium.
Fig. 12: © RBG Edinburgh.

Original labels:

Fig. 1: **Isotype** of *C. tonkinensis*, Eberhardt 5073, no date, Kaï Kinh, Langson [Tonkin], Vietnam.

Fig. 2: Crielin 38.578, 1918-09-12, “*Dacrydium elatum*”, Tonkin: Division de Bac-Le: Tung-Tung (massif du Deo Ben), Vietnam.

Fig. 3: Mignucci s.n. (Forêts série X n° 35), 1922-06-00, “*Dacrydium Elatum*”, Hoàng-Dam (local name) Bac-Lê, Province de Bac-Giang, Vietnam.

Fig. 4 & 5: A. Chevalier 29.662, 1913-12-19, “Cây hoang dan (annomite) cèdre et bois de santal (colous)” / “*Cupressus torulosa* Don” / “Tonkin: Province de Lang Són. Région du Cai Kin. Village de Quan Lan.”

Fig. 6: Pételot s.n., no date, “*Dacrydium pierrei* Hickel”. Long ba / Divison forestière de Bac Lê”, Vietnam.

Fig. 4: *C. tonkinensis* ([P06489697](#))

Fig. 5: *C. tonkinensis* ([P06489698](#))

Fig. 6: *C. tonkinensis* ([P06489699](#))





Fig. 7: *C. tonkinensis* ([P01642281](#)).



Fig. 8: *C. tonkinensis* ([P01636870](#)).

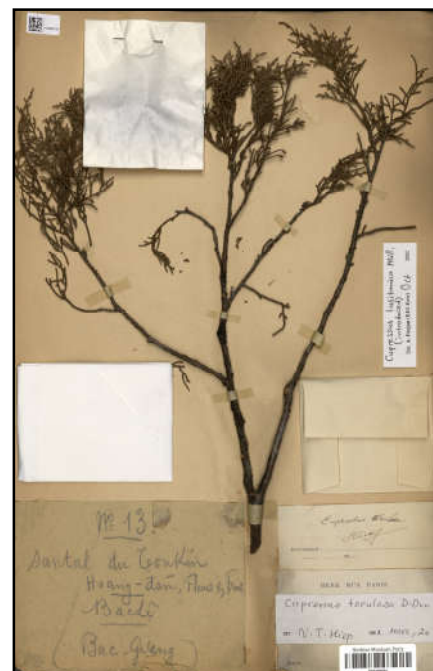


Fig. 9: *C. tonkinensis* ([P06489694](#)).

Original labels:

Fig. 7: *Castellini* 169, Hoang-Dang, locality: Song-Hoa, 1905.10.02.

Fig. 8: *A. Chevalier* s.n., 1914-12-00, “Thuya”, Tonkin, “fournissant le Bois de Cedre de la région de Langson”³, Vietnam. [³ “Providing the Cedar Wood of the Langson region”.]

Fig. 9: *N° 13*, no date, “Santal du Tonkin”, Hoang-dan, Baclê (Bac-Giang), Vietnam.

Fig. 10: *N.V.Thang* 111, Lang Son, Chilang, Van Linh, Lung Na village, ~250 m, 21°38’N, 106°26’E. Cultivated. 2003.12.19.

Fig. 11 & 12: *M.F.Gardner, P.Thomans & N.D.T.Luu* 137, Lang Son, Chilang, Van Linh, Hao village, 271 m, 21°38’22.1”N, 106°26’11.9”E. Cultivated. 2002.11.05.

Fig. 13: Holotype of *C. tonkinensis* – p. 80.

Wrong identifications:

Holotype (Fig. 13, p. 80): “*Cupressus torulosa* D. Don / Det. A. Farjon (RBG Kew) Nov. 2000.”

Figs 1-6: “*Cupressus lusitanica* Mill. / (introduced) / Det. A. Farjon (RBG Kew) Oct 2002.”

Fig. 7: “*Cupressus funebris* Endl. / (introduced) / Det. A. Farjon/Utrecht 25 Sept. 1991”

Fig. 10: *C. tonkinensis* ([NY00888007](#)). Fig. 11: *C. tonkinensis* ([NY00888008](#)). Fig. 12: *C. tonkinensis* ([E00182084](#)).



Photo gallery: *Cupressus austrotibetica*



All photos © R. Businsky, 1992. [Cf. **Map 2.**]

Fig. 1 (right & cover page) [335]:

Xizang 1992, mighty *Cupressus austrotibetica* South-West of Tongmai, Xizang, China.

30°03'11.5"N, 95°01'49.1"E, above the foot of the eastern slope.

The following photos were taken 0,2-2 km WSW of the confluence of the Parlung Tsangpo and the Layue Qu, ca 10 km SW of Tongmai.

Fig. 2 (below) [341b]: Xizang 1992, rocky ribs with *Pinus wallichiana*, *P. bhutanica* and *C. austrotibetica*. Predominantly northern slopes.

Fig. 3 (p. 91) [341]: Xizang 1992, ridge with *Pinus wallichiana*, *P. bhutanica* and *C. austrotibetica*. Predominantly northern slopes.

Fig. 4 (p. 92) [342]: Xizang 1992, gorge west of the confluence, bottom of the valley. Left slopes are predominantly northern, right southern.

Fig. 5 (p. 93) [343]: Xizang 1992, precipices with *Cupressus austrotibetica* in the fog. Predominantly northern slopes.

Businsky noted that “near around Tangmai *Cupressus* does not occur.”

The photo **[numbers]** are reported on Map 2.









Seed germination and seedling stage of *Cupressus vietnamensis*

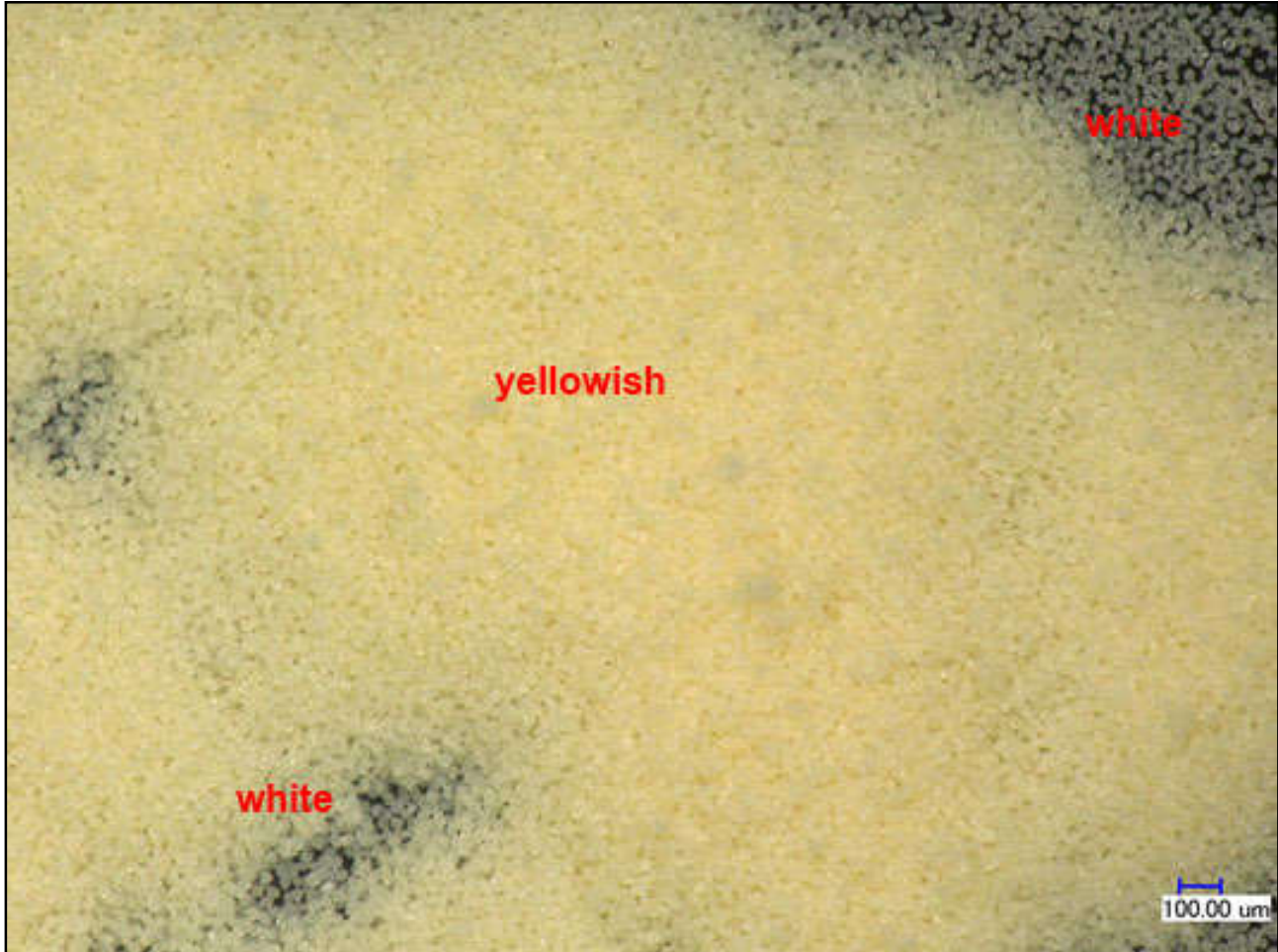
Seeds sent by Dr V. M. Dörken (Konstanz University, Germany) were received on the 26 April 2019. The 20 seeds (Figs 2 & 3) were soaked in tap water for 72 hours on the 5 May. Only five of them fell to the bottom (Fig. 4). On 8 May, the seeds were sowed in five different tubes, with four seeds per tube, and the five seeds which had fallen to the bottom of the water, each one in a different tube. One tube was placed for three weeks in the refrigerator and the remaining tubes under glass without additional heating. Heather earth compost was used, as an acidic medium is quite useful to avoid damping off by fungi. The tubes were irregularly watered.

On 29 November, two seedlings were discovered with the cotyledons already completely out of the medium. The germinated seeds were not the ones stored for three weeks in the refrigerator. The stem was elongated (3.5cm), likely because of the poor light conditions in this November month: very cloudy, 26 days with rains, average temperature under glass: +10°C (min/max temperatures: +7.5°/+13°C).

Colour of the stem: bright light green, adaxial side of the cotyledons of the same colour as the stem, abaxial colour glaucous with a line of a darker green in the middle and the borders with the bright light green colour. The two cotyledons are larger than most other *Cupressus* species. The apex is obtuse. Length of the cotyledons: 11.30 to 13.80 mm; width: from 2.65 to 3.55 mm (cf. Figs 5 & 6).

On the 30 November, the seedlings were moved indoors under growing lamps at a constant temperature around 20°C.

Fig. 1: *C. vietnamensis* pollen displaying a colour graduation according to its density, from translucent white to yellowish. Scale bar: 100 µm. Photo: © V.M.Dörken.





Figs 2 & 3: Seeds of *C. vietnamensis*. Enlargement: 3x (Fig. 2 on mm paper). These seeds were the result of a controlled fertilisation with the pollen (cf. Fig. 1) of the same plant. These are typical *Cupressus* seeds with two lateral wings, a well marked hilum and small resin vesicles on their surface. These vesicles are numerous, but all cypress species so far examined have at least some vesicles.





Fig. 4: Seeds of *C. vietnamensis* soaked in tap water after three days.

Fig. 7 (p. 97, top): The two *C. vietnamensis* seedlings, with juvenile foliage, display an amazing different growth rate under the exact same conditions. 2021.03.25.

Fig. 8 (p. 97, bottom): Second smaller *C. vietnamensis* seedling. Tube diameters: 6.3 cm. 2021.02.09.

Fig. 5 (below middle): *C. vietnamensis* seedlings with two cotyledons soon after seedcoat release. 2019.12.01, 12h50.

Fig. 6 (bottom): *C. vietnamensis* seedlings one day after Fig. 5. 2019.12.02, 14h57.





Photo gallery: *Welwitschia mirabilis*

Twyfelfontein (550 m), Namibia

During a trip to Namibia, it was possible to observe the rare *Welwitschia mirabilis* unusually far from the coast (about 90 km inland) in a very dry and rocky landscape (2019-11-23). The area had received no rain for the last two years.

All photos © by the author.



Fig. 1: Dead and dry specimen exposed at the Twyfelfontein Country Lodge, Namibia (20°34'12.59"S, 14°22'6.53"E).

Fig. 3 (p. 99): Landscape view, showing the very dry and rocky environment. No other *Welwitschia* can be seen in the surroundings.

Fig. 2 (below): Specimen still alive, but heavily browsed by animals. Note the cones, one still attached to the plant, others broken on the soil.







Back cover: Majestic towering wild *C. austrotibetica*. Photo © A. Golinelli, 2008.

Old names	Current English	Chinese	Pinyin
Bangxin	Bangxin Township	帮辛乡	Bāng xīn xiāng
Bayi	Bayi District	巴宜区	Bā yí qū
Bayu	Bayu - village	八玉	Bā yù
Bome	Bomê County	波密县	Bō mì xiàn
Chabji La	?		
Chuluk - village	Destroyed - W. of Tongmai		
Dongjiu Qu	Dongjiu - river	东久曲	Dōng jiǔ qū
Dre	Baicun - village	柏村	Bǎi cūn
Gedangxiang	Gedang - Township	格当乡	Gé dāng xiāng
Gendengcun	Gendeng - village	根登村	Gēn dēng cūn
Gompone	Yarlung - Parlung junction		
Gyadzung	Jiazhong - village	甲中	Jiǎ zhōng
Gyantse	Gyantse County	江孜县	Jiāngzī xiàn
Lang	Nang County	朗县	Lǎng xiàn
Lang Ho	Layue Qu - river	拉月曲	Lā yuè qū
Mêdog	Mêdog County	墨脱县	Mò tuō xiàn
Motuo	Mêdog County	墨脱县	Mò tuō xiàn
Nang	Nang County	朗县	Lǎng xiàn
Nyingchi	Linzhi Prefecture	林芝市	Línzhī shì
Palong Zangbo	Parlung Zangbo - river	帕隆藏布	Pà lóng zàng bù
Parlung Tsangpo	Parlung Zangbo - river	帕隆藏布	Pà lóng zàng bù
Pe	Pei - town	派镇	Pài zhèn
Pharlung	Parlung Zangbo - river	帕隆藏布	Pà lóng zàng bù
Po Chu	Parlung Zangbo - river	帕隆藏布	Pà lóng zàng bù
Po river	Parlung Zangbo - river	帕隆藏布	Pà lóng zàng bù
Po Tsangpo	Parlung Zangbo - river	帕隆藏布	Pà lóng zàng bù
Po Yigrong	Yi'ong Zangbo - river	易贡藏布	Yì gòng zàng bù
Polung river	Parlung Zangbo - river	帕隆藏布	Pà lóng zàng bù
Pome	Bomê County	波密县	Bō mì xiàn
Rong Chu	Layue Qu - river	拉月曲	Lā yuè qū
Sangyü	Shuangyu - village	双于	Shuāng yú
See-Hoo	Xihu - lake	西湖	Xī hú
Showa	Zhamo - Bomê capital	扎木镇	Zhā mù zhèn
Sokang la	Mt. Pass - near Bayu		
Su La / Sü La	Mt. Pass - S. of Zhamo		
Tang me	Tongmai - village	通麦	Tōng mài
Tang tö	Tangdui - village	塘堆	Táng duī
Tangdui	Tangdui - village	塘堆	Táng duī
Tangmai	Tongmai - village	通麦	Tōng mài
Tangme	Tongmai - village	通麦	Tōng mài
Tawan	Dagong Longba	打贡隆巴	Dǎ gòng lóng bā
Tong Mai	Tongmai - village	通麦	Tōng mài
Tongkyuk chu (lower part)	Layue Qu - river	拉月曲	Lā yuè qū
Tongkyuk chu (upper part)	Dongjiu Qu - river	东久曲	Dōng jiǔ qū
Tongyuk river (lower part)	Layue Qu - river	拉月曲	Lā yuè qū
Tralung Chu	Zhaben Longgou - ditch	扎本龙沟	Zhā běn lóng gōu
Trulung	Pailongcun - village	排龙村	Pái lóng cūn
Trulung Chu	Peilong Gongzhi - stream	培龙贡支	Péi lóng gòng zhī
Tsangpo	Yarlung Zangbo River	雅鲁藏布江	Yǎ lǔ zàng bù jiāng
Tsela Dzong	Zelagangcun - village	则拉岗村	Zé lā gǎng cūn
Xizang	Tibet - Region	西藏	Xī zàng
Yarlung Tsangpo	Yarlung Zangbo River	雅鲁藏布江	Yǎ lǔ zàng bù jiāng
Yigong	Yigongxiang - Township	易贡乡	Yì gòng xiāng
Yigong Tsangpo	Yi'ong Zangbo - river	易贡藏布	Yì gòng zàng bù
Yigong Zangbo	Yi'ong Zangbo - river	易贡藏布	Yì gòng zàng bù
Yigrong	Yi'ong Zangbo - river	易贡藏布	Yì gòng zàng bù
Yigrong Chu	Yi'ong Zangbo - river	易贡藏布	Yì gòng zàng bù
Yigrong Lake	Yigong Hu (Cuo) - lake	易贡湖 (错)	Yì gòng hú (cuò)
Yigrong river	Yi'ong Zangbo - river	易贡藏布	Yì gòng zàng bù
Yigrong Tsangpo	Yi'ong Zangbo - river	易贡藏布	Yì gòng zàng bù
Yigrong Tso	Yigong Hu (Cuo) - lake	易贡湖 (错)	Yì gòng hú (cuò)
Yigung	Yi'ong Zangbo - river	易贡藏布	Yì gòng zàng bù
Yiong Chu	Yi'ong Zangbo - river	易贡藏布	Yì gòng zàng bù
Yi'ong Tsangpo	Yi'ong Zangbo - river	易贡藏布	Yì gòng zàng bù
Yiwong	Yi'ong Zangbo - river	易贡藏布	Yì gòng zàng bù

List of Chinese names and their English translations, by J. Hoch & Li Shurong