Bulletin of the *Cupressus* Conservation Project

Volume 2 No 1 – 21 June 2013

Contents

Volume 2 Number 1

This Bulletin is edited by the ***Cupressus* Conservation Project**, a non-profit organisation based in Geneva, Switzerland. It deals mainly with *Cupressus* species, but accepts manuscripts on other species of conifers. Emphasis is given to threatened and endangered taxa. Manuscripts are accepted in the following languages : English, French, German, Spanish, Italian and Russian. The Bulletin is peer reviewed.
Responsible Editors : D. Maerki & Michael Frankis (England) – Contact by email : bulletin@cupressus.net
Editors : Jeff Bisbee (USA), Thierry Lamant (France), Joey Malone (USA), Patrick Perret (Switzerland).

Reference : *Bull. CCP.*
Prices : online pdf version : free access ;
printed version : 30 CHF or 26 Euro per issue. Airmail shipping worldwide included. Publication is irregular. Payment after delivery. After one's subscription, the next issues will be sent automatically, unless cancellation of the subscription takes place before shipping. www.cupressus.net/subscription.html
Web site : www.cupressus.net – Bulletin web site : www.cupressus.net/bulletin.html
Online PDF Version : ISSN 2235-400X

© Cover photo : Oxford University Herbaria, Department of Plant Sciences :
Cupressus nootkatensis, Menzies collection, OXF-00019730K.

Nomenclatural notes on *Cupressus nootkatensis* D.Don – 2

Rediscovery of the holotype of *Cupressus nootkatensis* D.Don

ABSTRACT The holotype of *Cupressus nootkatensis* D.Don, long thought lost, has been located at Oxford Herbarium (OXF). Notes are also given on the status of other specimens at Kew, Missouri and New York hitherto considered isotypes, but found to have no type status.

The Nootka Cypress *Cupressus nootkatensis* was first described by David Don in the second volume of Lambert's first edition of *Description of the Genus Pinus* (1824: 18), based on specimens collected by Archibald Menzies at Nootka Bay (now Yuquot ; 49° 35' 33.42" N 126° 36' 55.69" W) on the west coast of Vancouver island (British Columbia, Canada), as clearly indicated in the protologue, reproduced here :

CUPRESSUS NOOTKATENSIS.

NOOTKA CYPRESS.

C. NOOTKATENSIS, ramulis tetragonis, foliis latè ovatis acutis dorso convexis quadrifariam imbricatis appressis, galbalis globosis subsessilibus: squamis umbonatis lævibus.

Habitat ad Sinum Nootka dictum, in Plagâ occidentali Americæ borealis. *Menzies.*

DESCRIPTIO.

Arbor..... *Rami* teretes, patuli, foliis emarcidis squamati, cortice rufo tecti. *Ramuli* numerosi, subdistantes, tetragoni, breves, patuli. *Folia* latè ovata, acuta, valdè coriacea, glabra, nitida, arctè appressa, quadrifariam imbricata, dorso convexa; *adultiora* apice brevè subulata. *Galbali* globosi, laterales, magnitudine *Cerasi sylvestris*, rore glauco cœrulescentes, pedicello brevissimo squamoso ramulis simili suffulti: *squamis* trapeziformibus, petlatis, lævibus, centro umbonatis.

This material was collected Menzies either during his trip as surgeon on the *Prince of Wales*, a ship commanded by Captain James Colnett arriving in the Nootka Bay on 6 July 1787 and staying there for a month trading with the Mowachaht First Nation tribe (Galois, 2004), or during his second trip there as naturalist on the *Discovery* under Captain Vancouver from 28 August to September 1792 (Newcombe, 1923). The first volume of *Description of the Genus Pinus* was published by Aylmer Bourke Lambert in 1803. The second volume was completed by David Don in 1824, working with Lambert's herbarium, which hosted many of the Menzies collections, if not all.

Farjon *& al.* (2002) cited only isotypes of *Cupressus nootkatensis*, giving the following information :

> TYPE: Canada. British Columbia: Hecate Strait. Banks Island ["northwest coast of North America behind Bank's Island"]. 1787, *A. Menzies s.n.* (holotype, not seen; isotypes, K. MO).

As pointed by Garland and Moore (2012; see further below), the Hecate Strait and Banks Island[1] locations do not correspond to the protologue and must be rejected altogether as type material.

Farjon (2005: 426) gave the same information as in 2002 only changing "1787" to "1786-89" and "holotype, not seen" to "holotype BM(?), n.v.", and added (2005: 428) that a search for a holotype at BM proved negative.

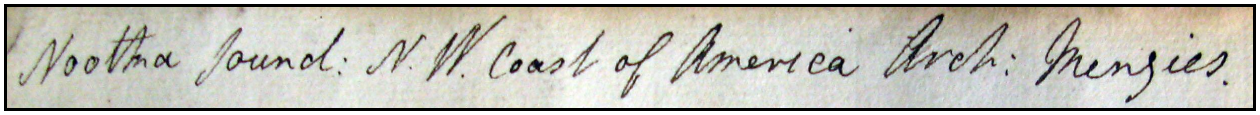
[1] The *Prince of Wales* was in the whereabouts of Banks Island between 5 September and 19 November 1787 (Galois, 2004) .

Mill & Farjon (2006), after citing in full the locality described in the protologue, repeated "1786-1789, *A. Menzies s.n.* (holotype: BM (lost?) n.v.: isotypes: K, MO)", suggesting that the holotype was lost by the British Museum herbarium.

Finally, Farjon (2010) concluded, not mentioning explicitely the Banks Island locality (but see MO) and citing the Nootka Sound on Vancouver Island, that the holotype is "not located". The K and MO specimens are still cited as isotypes .

In a recent article, Garland and Moore (2012) listed the possible nothonames according to the nomenclature rules for the various generic name changes with Nootka Cypress *Cupressus nootkatensis* as a parent of three hybrid cypresses [2]. Reviewing the status of the Nootka Cypress, the authors questioned the material in the herbaria at K, MO and NY, which are cited as type or isotypes, but which fail to correspond adequately to the type as described by David Don.

David Don used Lambert's herbarium for his description (Miller, 1970). After Lambert's death in January 1842, the herbarium was sold to pay for the debts of its deceased owner (Miller, 1970). The different parts of this important collection were separated in lots and after their purchase landed in several different institutions, G, BM, K, PH, OXF, and CGE. According to Miller, Oxford acquired the Menzies collections from the Lambert herbarium, suggesting that enquiries at OXF might be worthwhile. This proved to be the case, as the holotype used by David Don is indeed stored in the Oxford herbarium. On 13 March 2013, DM sent a message to Stephen Harris, curator at the Oxford herbarium, to ask if any possible Menzies specimen of *Cupressus nootkatensis* was present in the said herbarium. The very same day came a positive reply with the image of the sheet. On it is the only original caption, "*Cupressus nootkatensis* Lambert herb." (see cover page); no subsequent labels are present. Already this was enough to be sure that it represents the **holotype** viewed by David Don. The main arguments at this point were the "Lambert herb." original caption and the fact that the spelling of "nootkatensis" was identical to the one used by David Don, contrary to the other sheets designated as isotype by various authors and which bear the later spelling "Nutkatensis" introduced by Hooker in 1840. Two days later, in the next correspondence exchange, Stephen Harris brought a definitive confirmation: while examining the specimen more attentively, he found on the back of the sheet a second original mention with the same handwriting as the one visible on the first page: "Nootka Sound : N.W. Coast of America Arch: Menzies."



Analysis of the herbarium sheets claimed as *Cupressus nootkatensis* isotypes.

See page 7 for reduced images of these sheets (fig. 2 to 4).

New York Botanical Garden Herbarium (NY-00019060) [fig. 4, p. 7] **:**

1) Grey label viewed as the older one :

"(Thuja)
Ex Herbario Musei Britannici
Cupressus Nutkaensis Lamb.
Thuja n. sp.
N.W. Coast America
Menzies."

2) "New York Botanical Garden
Chamaecyparis nootkatensis (D.Don) Spach
T. Zanoni 1979"

[2] We continue to maintain Nootka Cypress in *Cupressus*, and regard these name changes as superfluous.

3) "ISOTYPE OF :
Cupressus nootkatensis D. Don
Descr.Pinus (Lambert) 2:18, 1824.
verif. T. Zanoni 2002"

4) "*Menzies s.n.* ISO – isotypes – K, MO
ISOTYPE OF : *Xanthocyparis nootkatensis* (D.Don) Farjon et Harder
Cited in *Novon* 12(2): 188 (2002)
Canada, British Columbia, Banks Island, 1787
det. J. Silba 8/15/02"

Comments : this sheet does not have any original handwriting, there is no evidence that it was part of Lambert herbarium, and the precise locality is absent. The Banks Island information is a citation from Farjon (2002).

Missouri Botanical Garden Herbarium (MO-1613520) [fig. 3, p. 7] **:**

1) Oldest label : "Menzies
Juniperus excelsa
N.W. Coast of America"

2) Blue label :

"Type Collection !
Ex Herbario Musei Britannici
Chamaecyparis nootkatensis (Don) Spach
Northwest coat of America
Behind Bank's Island
leg. Mr. Archibald Menzies c. 1787."

3) Label on the left side : "Chamaecyparis nootkatensis (D.Don) Spach
ISOTYPE
Determined by A. Farjon (k) 1 Aug 1999"

4) Label on the left side recovering label #3 :
"A = Thuja plicata
Determined by Damon Little 1/2003"

5) "Isotype of : Cupressus nootkatensis D.Don in Lamb.
= Xanthocyparis nootkatensis (D.Don) Farjon & Harder
Ref. Desc.Pinus 2: 113 1824
Missouri Botanical Garden (MO)"

6) "Type Specimen
HERB. M.B.G."

Comments : this specimen is clearly from Menzies collection (see note 1, p. 3), but the given locality is incompatible with the protologue and it must be excluded from the isotype list. Farjon failed to distinguish the two shoots of *Thuja plicata* attached to the same sheet, an oversight corrected by Damon Little.

Kew Botanical Garden Herbarium (K000089070) [fig. 2, p. 7] **:**

1) Oldest label : "Menzies
Cupressus
Nutkatensis"

Added at different places in different handwriting on the same sheet supporting the specimen :
" Lamb" – "*Type*" – "BR 15979"

And a stamp is also present : "Herbarium Hookerianum 1867"

2) Below the sheet supporting the specimen :
"Collected 1784 "Nootka" "

3) "*Chamaecyparis nootkatensis* (D. Don) Spach
Det. **A. Farjon** (RBG Kew) Jan 2000"

4) "*Xanthocyparis nootkatensis* (D. Don) Farjon & al.
Det. Aljos Farjon (RBG Kew) 29 June 2001"

5) "ISOTYPE
of Cupressus nootkatensis D.Don
in Lambert, Descr. Pinus 2: 18. 1824"

Comments : the spelling "Nutkatensis" is evidence that this annotation is from after 1840, when Jackson Hooker introduced it. Other than *Menzies*, Hooker refers to two herbarium sheets, Observatory Inlet. *Dr Scouler*, and Sitcha, *Bongard* (*in Herb, nostr.*).

The "collected 1784 "Nootka" " is Farjon's handwriting (compare the 'ootka' with 'ootka' on his isotype label); so is the "BR 15979" at the top. The "Type" is a different hand, but the same person as who added "Lamb." at the end of "Menzies, Cupressus nutkatensis".

More important is that the "Menzies, Cupressus nutkatensis" is the same hand as the "Cupressus Lawsoniana, California Beardsley". Since *Chamaecyparis lawsoniana* was not discovered until 1853, it leaves severe doubts as to the Nootka Cypress specimen being type material of any sort. It appears to be a comparison sheet that was made up for ease of learning how to distinguish them (perhaps Hooker, as it is from the Hooker Herbarium?), with no evidence for the *Cupressus nootkatensis* specimen being any older than the *Chamaecyparis lawsoniana* specimen. While it could be an older specimen that he annotated, it could just as easily be a new specimen from any time between 1853 and the 1867 date stamp on the sheet.

Conclusion

The Oxford specimen is the only one that explicitly states it is from Lambert's herbarium, and therefore the only one we can rely on D.Don having seen. There are only recent statements on the other sheets attributing them to Menzies. The holotype of *Cupressus nootkatensis* is therefore located at Oxford herbarium:

Cupressus nootkatensis D.Don, 1824, in Lambert, *The Description of the Genus Pinus* 2: 18.
Holotype : Nootka Sound, N.W. Coast of America, [Vancouver Island, British Columbia, Canada,] undated, *Menzies s.n.*, OXF (OXF-00019730). See fig. 1, p. 7.

Acknowledgments

We would like to thank Dr. Stephen Harris, Druce Curator of the Oxford University Herbaria, for his assistance in locating and photographing Don's specimen, without which this research would not have been successful.

Bibliography

Farjon, A., Nguyen T. Hiep, D.K. Harder, Phan K. Loc & L. Averyanov, (2002). A New Genus and Species in Cupressaceae (Coniferales) from Northern Vietnam, *Xanthocyparis vietnamensis*. *Novon* 12: 179-189.

Farjon, A. (2005). *A Monograph of Cupressaceae and of Sciadopitys*. Kew Publishing, Richmond, Surrey, UK.

Farjon, A. (2010). *A Handbook of the World's Conifers*. 2. vol., Brill, Leiden, The Netherlands.

Galois, R., ed. (2004). *A Voyage to the North West Side of America: The Journals of James Colnett, 1786-89*. UBC.Press, Vancouver, Canada.

Garland, M. A. & G. Moore (2012). ×*Hesperotropsis*, a new nothogenus for intergeneric crosses between *Hesperocyparis* and *Callitropsis* (*Cupressaceae*), and a review of the complicated nomenclatural history of the Leyland cypress. *Taxon* 61: 667-670.

Hooker, W. J. (1840). *Flora Boreali-Americana, or the Botany of the Northern Parts of British America*. Vol. 2, H.G.Bohn, Covent Garden, London, UK.

Lambert, A. B. (1824). *A Description of the Genus Pinus, To which is added An Appendix containing Descriptions and Figures of Some Other Remarkable Plants, and an Account of the Lambertarian Herbarium by Mr. David Don*. 1st ed. 2nd vol. Weddell, Walworth, London, UK.

Mill, R. R. & A. Farjon (2006). (1710) Proposal to conserve the name *Xanthocyparis* against *Callitropsis* Oerst. (Cupressaceae). *Taxon* 55: 229-231.

Miller, H. (1970). *The Herbarium of Aylmer Bourke Lambert, Notes on its Acquisition, Dispersal, and Present Whereabouts*. *Taxon* 19: 489-553.

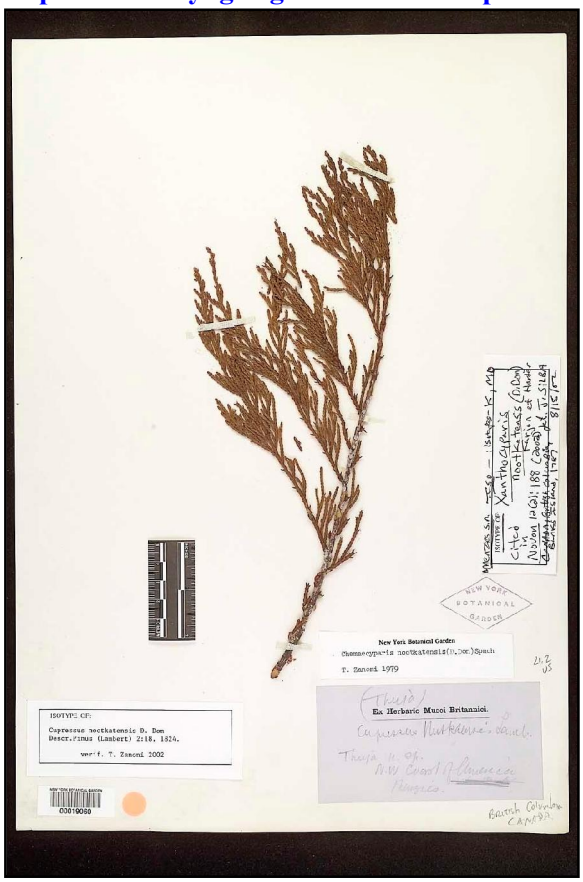
Newcombe, C. F., ed. (1923). *Menzies' Journal of Vancouver's Voyage, April to October, 1792*. Archiv of British Columbia, Memoir No. 5. Victoria, B.C., Canada.

Fig. 1 : *Cupressus nootkatensis* OXF-00019730K
© Oxford University Herbaria, Dept of Plant Sciences

Fig. 2 : *Cupressus nootkatensis* K000089070
© Kew Royal Botanical Garden Herbarium (K)

Fig. 3 : *Cupressus nootkatensis* MO-1613520
© Missouri Botanical Garden, used with permission
http://www.tropicos.org

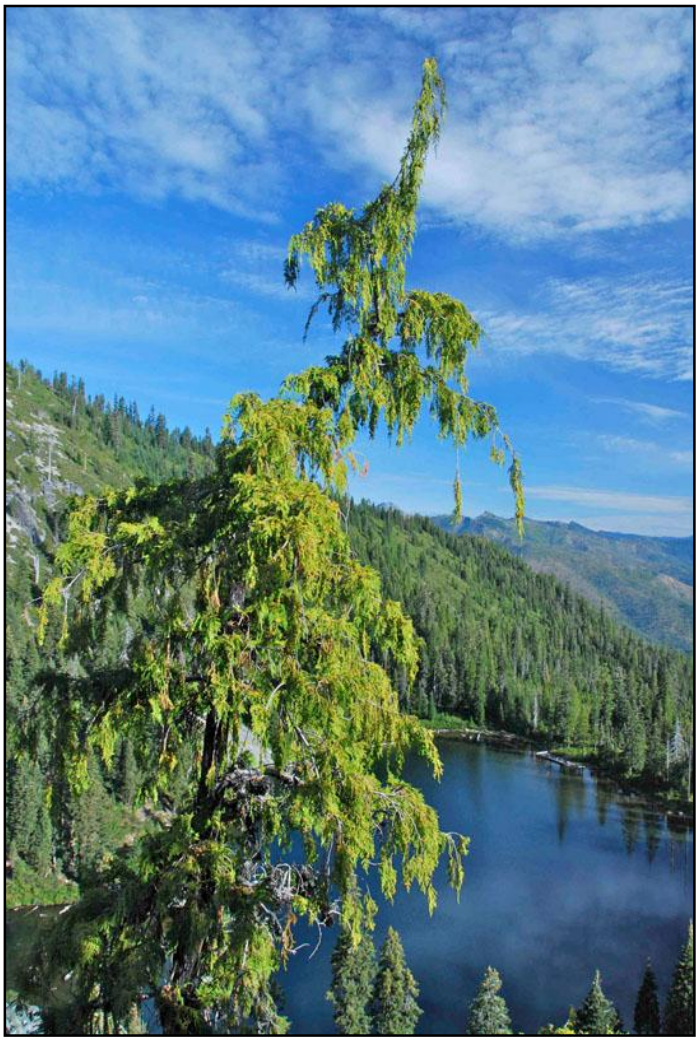
Fig. 4 : *Cupressus nootkatensis* NY-00019060
© New York Botanical Garden Herbarium (NY)
http://sciweb.nybg.org/science2/vii2.asp

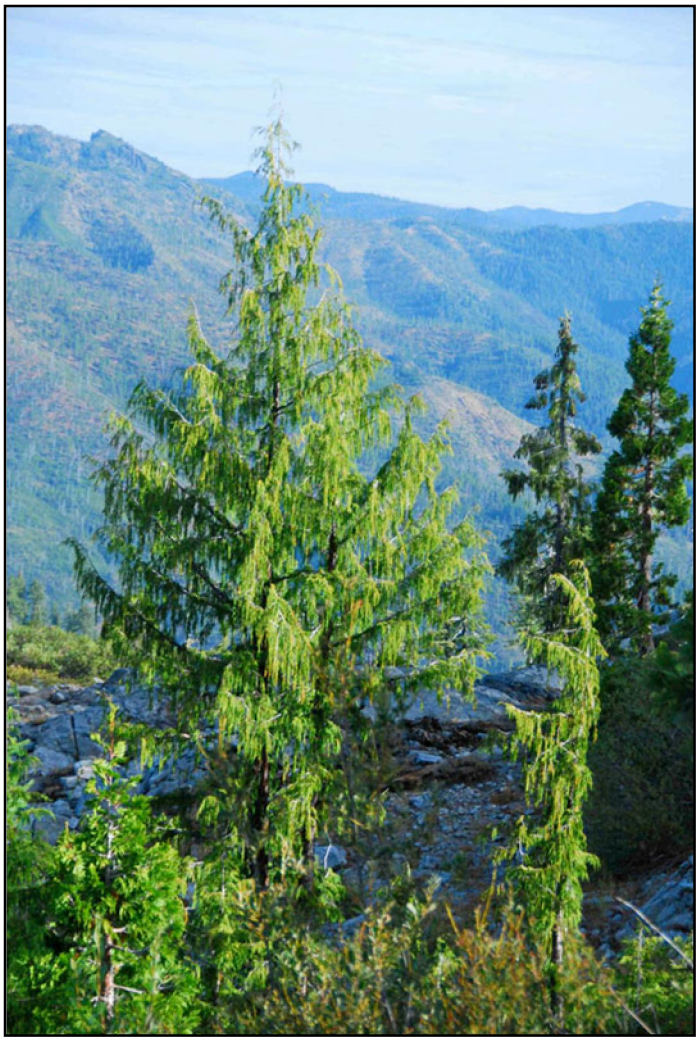


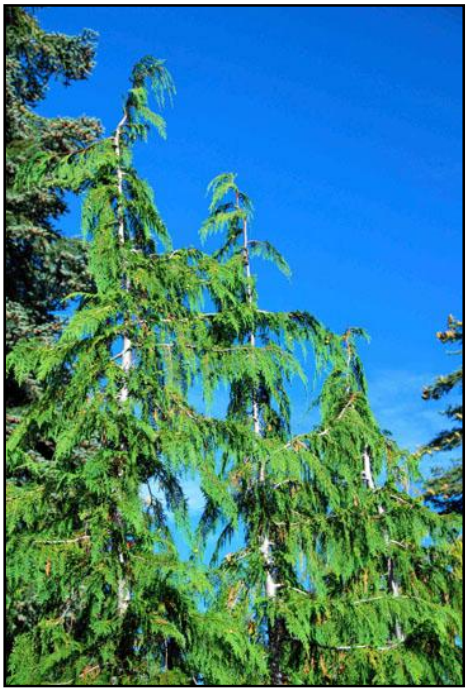
Cupressus nootkatensis D.Don 1824

NOOTKA CYPRESS

Bear Lake, Siskiyou County, California, USA.







Page 8, upper right : growing with *Picea breweriana*.
Page 9, lower right : growing with *Calocedrus decurrens*, on left side of photo. **(Continued on page 36.)**

Bull. CCP 2 (1): 10-16. (6.2013)

The Status of Wild and Cultivated Populations of *Cupressus tonkinensis* Silba in Vietnam

Pham Van The[1], Phan Ke Loc[2,3], Nguyen Tien Hiep[1,2] and John Silba[4]

[1] *Institute of Ecology and Biological Resources, Vietnam Academy of Science & Technology, Hanoi, Vietnam*
[2] *Center for Plant Conservation, Vietnam Union of Science & Technology Associations, Hanoi, Vietnam*
[3] *Hanoi University of Science, Hanoi, Vietnam*
[4] *Alumni Professor, 20 Raemoor Drive, Palm Coast, Florida 32164, USA*

Corresponding author: phamvthe@gmail.com

ABSTRACT

Cupressus tonkinensis Silba is a critically endangered conifer species in northern Vietnam, where there is only one wild population with 25 small individuals within a small area of Cai Kinh massif. The total count of cultivated trees is 84 individuals : 58 trees in Huu Lien commune, Huu Lung district; 16 trees in Yen Thinh commune, Huu Lung district and 10 trees in Van Linh commune, Chi Lang district. The height and diameter of each individual in both populations were measured. One year observations made on 51 individuals in Huu Lien plantings was recorded.

Key words: Cupressus tonkinensis, conifer, conservation, endangered species, Vietnam.

Cupressus tonkinensis Silba is a local endemic, restricted to Cai Kinh limestone massif located between 22°16' – 22°31' North latitude and 105°22' – 105°29' East longitude in Huu Lung district, Lang Son province, northern Vietnam. The limestone massif has a total area of about 42,000 hectares and elevation not exceeding 700 m asl (Fig. 2.a). The climate in this area is monsoonal with mild winters and summer rains, average annual temperature is 22-23°C, with three cooler months of winter (monthly average temperature less than 17°C), and total annual rainfall of about 1400-1500 mm (Averyanov *et al.*, 2003). The original forest cover has been described as evergreen broad-leaf closed forest with four forest strata and canopy cover of 80-100%. Today the primary forest of the massif is replaced by grassland, shrub and secondary forest.

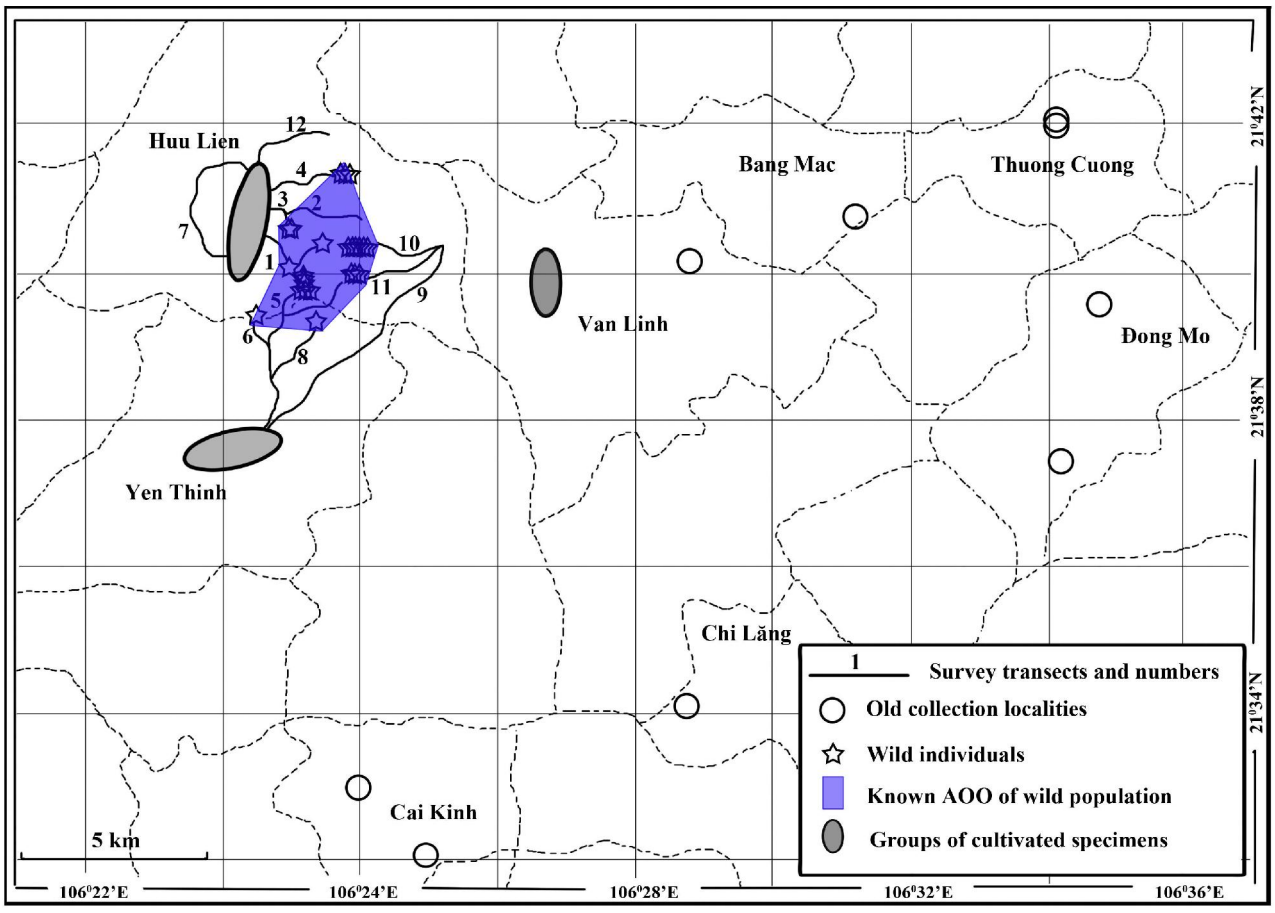
Although *Cupressus tonkinensis* is not currently placed on the IUCN Red List, due to its confused taxonomic identity (Silba, 1994), it is clear that the species is Critically Endangered since its extent of occurrence is 204 km^2 and the area of occupancy is 8 km^2 (D. Little *et al.*, 2011). The species is recognised for having highly significant scientific, economic, and conservation values. The commercial exploitation of this species during the last century led to its near extinction, with less than 50 small individuals remaining in the wild and few cultivated in local private gardens (Nguyen Tien Hiep *et al.,* 2011). This paper focuses on the status of the wild and cultivated populations of *Cupressus tonkinensis* in Vietnam.

Material and Methods

From 2008 to 2009, eight field surveys and inventories were conducted to assess the conservation status of wild and cultivated populations of *Cupressus tonkinensis* in Huu Lien Nature Reserve, Lang Son province, northern Vietnam. Twelve transects were established at elevations between 200 m and 464 m asl. Voucher specimens were collected and stored in the herbarium (HN) of the Institute of Ecology and Biological Resources in Hanoi.

Results and Discussion

Natural population : there is only one wild population with 25 small individuals recorded within a small area at Cai Kinh massif in Huu Lien Natural Reserve (Appendix 1; Fig. 1.; Fig. 2.b). The height of trees ranges from 0.3 m (No. H_HL 20) to 3.5 m (No. H_HL 04 – Fig. 1.g), the average height is 1.2 m. The largest tree (No. H_YT 04) with 1.5 m height and 15 cm diameter near ground line (DNG) was cut by local people for commercial exploitation (Fig. 1.a,b). The diameter near ground level (DNG) ranges from 1.0 to 15 cm; the average DNG is 4.1 cm. Only six trees are bearing seed cones (No. H_HL 10, 13, 14, 15; H_YT 04, 05) (Fig. 1.c,d,f). The wild population represents remnant trees that escaped destruction because of their being located on steep cliffs, and for being too small for commercial exploitation (Fig. 1.). In natural conditions, the trees grow very slowly because of depauperate soil. There are no large trees or regenerated trees. It is estimated that they are more than ten years old and are threatened by wildfire and human disturbance. The area of occupancy (AOO) of the population is 5.7 km^2 (see Map 1).



Map 1 : The distribution of *Cupressus tonkinensis* in the past and present at Cai Kinh massif.

Cultivated population : *Cupressus tonkinensis* exists in cultivation around Cai Kinh massif (Map 1) with three groups and 84 individuals in total. The biggest group is located in Huu Lien commune with a total 58 individuals (Appendix 2; Fig. 2.c). Planted during 1992 – 2000, their heights range from 1.6 m (No. T_HL 35) to 9 m (No. T_HL 11); the average height is 5.4 m. The DNG ranges from 3 cm (No. T_HL 05) to 21.2 cm (No. T_HL 02); the average DNG is 10.4 cm. Nine trees bear seed cones (No. T_HL 02, 18, 19, 23, 24, 27, 28, 29, 33).

Fig.1 : Wild population of *Cupressus tonkinensis* : **a**, **b** (H_YT04) – A big tree has just been cut by local people ; **c** (H_HL14), **d** (H_HL10) – Trees bearing seed cones ; **e** (H_YT08) – One of the best wild tree ; **f** – Seed cones ; **g** (H_HL04) – Trunk of the highest tree. (All photos by Pham Van The)

Fig.2 : Habitat and conservation of *Cupressus tonkinenis*: **a** – Natural habitat in Cai Kinh limestone massif ; **b** (H_YT07) – A small wild tree ; **c** – Cultivated tree in a private garden with many seed cones ; **d** – Propagation by cuttings ; **e** – Small tree grown from a cutting ; **f** – Seedlings with two cotyledons. (All photos by Pham Van The)

The second group located in Yen Thinh commune has 16 individuals (Appendix 3). Planted during 1990 – 2002, their heights range from 3 m (No. T_YT 05, 11) to 7 m (No. T_YT 01, 02, 10, 13); the average height is 5.2 m. The DNG ranges from 6 cm (No. T_YT 11) to 20 cm (No. T_YT 01, 10); the average DNG is 11.1 cm. Five trees bear seed cones (No. T_YT 02, 03, 05, 06, 09).

The third group located in Van Linh commune has 10 individuals (Appendix 4). Planted during 1995 – 2007, their heights range from 4 m (No. T_VL 05) to 10 m (No. T_VL 06, 07, 08); the average height is 7.5 m. The DNG ranges from 6 cm (No. T_VL 05, 10) to 23 cm (No. T_VL 06); the average DNG is 15.1 cm. Six trees bear seed cones (No. T_VL 01, 02, 03, 04, 06, 07).

One year observation of the status of trees in cultivation in Huu Lien commune : Observations made from December 2008 to November 2009 on 51 individuals at Huu Lien commune showed increase of DNG from 0 cm (T_HL 10) to 4.8 cm (T_HL 23), with average of 0.9 cm. The increase in height ranged from 0 m (T_HL 10) and 0.9 m (T_HL 12), with average of 0.3 m (Chart 1). Many trees are tall but they did not have cones because they have not yet reached maturity. The results showed that the species thrives better in cultivation than in the wild.

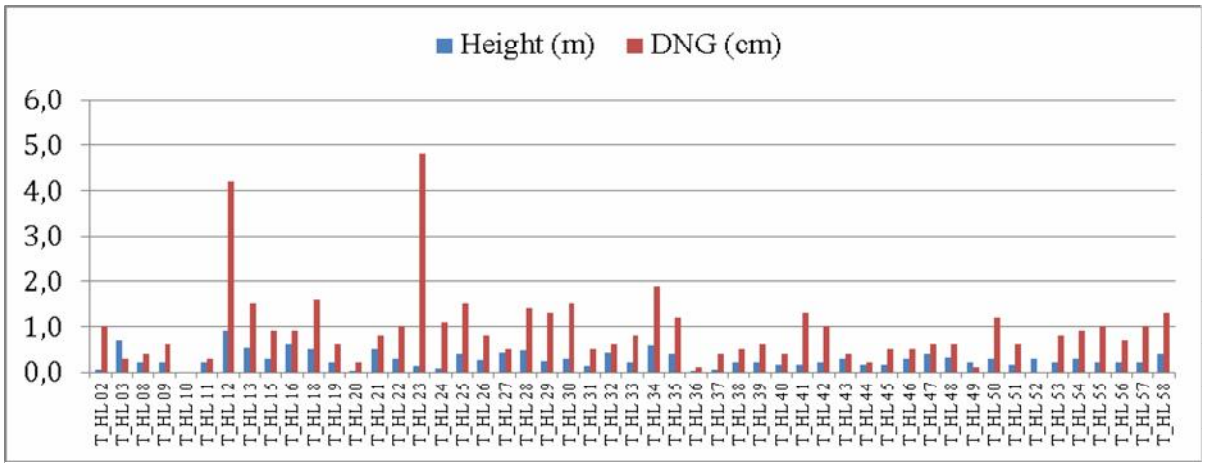


Chart 1: The growth condition of *Cupressus tonkinensis* at Huu Lien cultivated group (December 2008 – November 2009)

Propagation : Recent scientific studies by botanists in Hanoi and subsequent authors in this paper have verified that *Cupressus tonkinensis* has a very low percentage of viable seeds. Like *Cupressus dupreziana* A.Camus of Algeria, this is probably due to the low number of individual trees in the wild populations, and the low probability of cross-pollination of individual trees. The cultivated trees of *Cupressus tonkinensis* in Huu Lung also produce cones with seeds having a very low germination rate (Fig. 2.c). Like other Asiatic *Cupressus* species, germination trials of *Cupressus tonkinensis* in Hanoi have indicated that this species has only two cotyledons in its seedlings (Fig. 2.f). *Cupressus tonkinensis* is currently cultivated in the United Kingdom, from botanist Keith Rushforth's collections (herbarium vouchers at Edinburgh-E). Keith Rushforth made two collections from Huu Lung, as *KR-7317*, and *KR-7325*. There are living plants of K.Rushforth at Tregrehan Gardens in Cornwall, England. Recently, researchers at Atlanta Botanical Garden in Georgia (USA) have attempted to root cuttings from the Rushforth collections in England, however these early attempts were not successful because the cuttings were taken during the winter. It seems that *Cupressus* cuttings root better during the summer ; hence more attempts by researchers at Atlanta Botanic Garden to propagate the Rushforth collections in England are planned for the near future. In addition, the Center for Plant Conservation (Vietnam) produced 130 individuals from cuttings during the years 2009-2011 (Fig. 2.d,e). Almost all of them now are growing very well (Nguyen Tien Hiep *et al.*, 2011).

Conclusion

In Vietnam, there is only one wild population with 25 small individuals found in a small area at Cai Kinh massif in Huu Lien Natural Reserve, Lang Son province, northern Vietnam. Only six trees bear seed cones. The remaining population has very poor regeneration and is always threatened by forest fire and human disturbance. The area of occupancy of the population is 5.7 km^2.

Cupressus tonkinensis exists in cultivation within the Cai Kinh massif with a total 84 individuals. The plantings are located in Huu Lien commune with 58 individuals, in Yen Thinh commune with 16 individuals, and in Van Linh commune with 10 individuals.

One year observations made on 51 individuals in Huu Lien plantings recorded increases of DNG from 0 cm to 4.8 cm; the average is 0.9 cm. Height increases ranged from 0 m to 0.9 m; the average is 0.3 m. The species appear to grow better in cultivation than in the wild.

Acknowledgments

Authors would like to thank Dr. Jacinto Regalado for his help with English revision. This research has been supported by grants from the Vietnam Academy of Science and Technology Fund for Young Scientists, the Rufford Foundation Small Grant Program (RSG_ID: 29.03.09) and from Forestry Development Department of Lang Son Province, Vietnam.

Bibliography

Averyanov, L., Loc K. Phan, Hiep T. Nguyen and D. Harder (2003). Phytogeographic review of Vietnam and adjacent areas of Eastern Indochina. *Komarovia* 3: 1-83.

Silba, J. (1994). The trans-Pacific relationship of Cupressus in India and North America. *Journal of the International Conifer Preservation Society* 1: 23.

Little, D., P. Thomas, Hiep T. Nguyen and Loc K. Phan (2011). Before it had a name: Diagnostic characteristics, geographic distribution, and the conservation of *Cupressus tonkinensis* (Cupressaceae). *Brittonia* 63: 171-196.

Nguyen Tien Hiep, Nguyen Quang Hieu, Phan Ke Loc, Tran Huy Thai, **Pham Van The**, Nguyen Sinh Khang, Nguyen Tien Vinh and Nguyen Minh Tam (2011). Addittional data on the population, content of essential oil and genetic diversity of *Cupressus tonkinensis* Silba in Huu Lien Nature Reserve, Huu Lung district, Lang Son province serving for assessment of its conservation status in Vietnam. *In* : Proceedings of the 4th National Scientific Conference on Ecology and Biological Resources: 609-615. *Hanoi, 21 October 2011.* Agriculture publishing house.

Appendix 1 to 4 :

Appendix 1. Status and distribution of *Cupressus tonkinensis* trees found in the wild.

No.	Height (m)	DNG (cm)	Lat. (N)	Lon. (E)	Elev. (m)
H_HL 01	1	4	21°40'20"	106°23'27"	442
H_HL 02	1	3	21°40'00"	106°23'06"	420
H_HL 04	3,5	10	21°40'34"	106°22'57"	320
H_HL 05	2,5	10	21°40'34"	106°22'57"	320
H_HL 06	1	2	21°41'19"	106°23'44"	464
H_HL 07	0,7	2	21°41'19"	106°23'44"	464
H_HL 09	1,5	3	21°41'16"	106°23'06"	437
H_HL 10	**1,5**	**3**	**21°41'16"**	**106°23'06"**	**437**
H_HL 12	0,5	2	21°40'17"	106°23'51"	379
H_HL 13	**1**	**2**	**21°40'17"**	**106°23'51"**	**379**
H_HL 14	**3**	**7**	**21°40'17"**	**106°23'51"**	**379**
H_HL 15	**2**	**5**	**21°40'17"**	**106°23'51"**	**379**
H_HL 16	1,5	4	21°40'17"	106°23'51"	379
H_HL 17	1	3	21°40'17"	106°23'51"	379
H_HL 18	0,5	2	21°39'59"	106°23'52"	300
H_HL 19	0,5	2	21°39'59"	106°23'52"	300
H_HL 20	0,3	1	21°39'59"	106°23'52"	300
H_YT 01	1	4	21°39'46"	106°23'09"	306
H_YT 02	0,5	2	21°39'46"	106°23'09"	306
H_YT 03	0,4	2	21°39'46"	106°23'09"	306
H_YT 04	**1,5**	**15**	**21°39'46"**	**106°23'09"**	**306**
H_YT 05	**1**	**5**	**21°39'46"**	**106°23'09"**	**306**
H_YT 06	0,7	2	21°39'46"	106°23'09"	306
H_YT 07	0,7	3	21°39'25"	106°22'29"	333
H_YT 08	1,5	4	21°39'20"	106°23'21"	406

Note: Boldfaced text indicates cone-bearing tree.

Appendix 2. Status of *C. tonkinensis* trees in cultivation in Huu Lien commune in 2008.

No.	Owner	Village	Height (m)	DNG (cm)	Year cultivated
T_HL 01	Hoang Quoc Toan	Tan Lai	3,0	8,0	1995
T_HL 02	**Hoang Van Chiem**	**Coc**	**8,3**	**21,2**	**1992**
T_HL 03	Nguyen Van The	Ao Bai	3,7	6,7	2000
T_HL 04	Vi Van Tiep	Lien Hop	3,0	4,0	1995
T_HL 05	"	"	2,0	3,0	1997
T_HL 06	Hoang Van Mien	"	5,0	7,0	"
T_HL 07	"	"	3,0	8,0	"
T_HL 08	Huu Lien NR	"	5,0	9,7	1994
T_HL 09	"	"	6,2	13,1	"
T_HL 10	"	"	2,0	4,6	"
T_HL 11	"	"	9,0	19,7	"
T_HL 12	"	"	4,0	9,6	"
T_HL 13	Hoang Van Dam	"	4,6	8,6	1998
T_HL 14	Vi Van Sao	Ben	4,0	11,0	1994
T_HL 15	Vi Van De	Lien Hop	4,0	7,0	"
T_HL 16	"	"	3,2	7,0	"
T_HL 17	Nguyen Van Tuyen	Ao Bai	4,0	7,0	"
T_HL 18	**Nguyen Van Khuong**	**"**	**5,6**	**10,8**	**"**
T_HL 19	**Nguyen Van Hoa**	**"**	**6,9**	**15,9**	**"**
T_HL 20	Nguyen Van Luyen	"	3,4	5,1	2000
T_HL 21	"	"	7,2	18,8	1994
T_HL 22	"	"	6,2	11,8	"
T_HL 23	**Hoang Van Phan**	**"**	**6,7**	**15,0**	**"**
T_HL 24	**"**	**"**	**6,4**	**13,9**	**"**
T_HL 25	Hoang Minh Luat	Tan Lai	6,7	11,1	"
T_HL 26	"	"	2,8	6,4	"
T_HL 27	**Hoang Trong Xa**	**Cuom**	**6,1**	**12,4**	**1998**
T_HL 28	**"**	**"**	**4,4**	**10,2**	**1994**
T_HL 29	**Hoang Van Quynh**	**Tan Lai**	**4,7**	**15,9**	**"**
T_HL 30	Hoang Van Quynh	"	4,9	15,9	"
T_HL 31	Hoang Van Dam	Lien Hop	3,1	8,3	"
T_HL 32	**Nguyen Van Khanh**	**Ao Bai**	**4,9**	**8,9**	**"**
T_HL 33	Huu Lien NR	Lien Hop	6,6	9,9	"
T_HL 34	Nong Van Yem	Ao Bai	3,0	5,1	1998
T_HL 35	"	"	1,6	3,2	"
T_HL 36	Huu Lien NR	Lien Hop	7,2	11,3	1994
T_HL 37	"	"	5,1	16,6	"
T_HL 38	"	"	6,5	6,1	"
T_HL 39	"	"	4,0	6,7	"
T_HL 40	"	"	8,2	11,1	"
T_HL 41	"	"	8,4	18,2	"
T_HL 42	"	"	7,0	11,1	"
T_HL 43	"	"	7,2	12,1	"
T_HL 44	"	"	6,2	14,6	"
T_HL 45	"	"	8,2	16,6	"
T_HL 46	"	"	7,5	8,6	"
T_HL 47	"	"	7,3	11,1	"
T_HL 48	"	"	2,9	5,7	"
T_HL 49	"	"	4,7	6,1	"
T_HL 50	"	"	8,3	17,8	"
T_HL 51	"	"	6,8	11,8	"
T_HL 52	"	"	7,8	11,8	"
T_HL 53	"	"	2,8	4,8	"
T_HL 54	"	"	6,9	10,0	"
T_HL 55	"	"	5,0	8,0	"
T_HL 56	"	"	7,0	9,9	"
T_HL 57	"	"	6,0	8,6	"
T_HL 58	"	"	5,9	10,2	"

Note: Boldfaced text indicates cone-bearing tree.

Appendix 3. Status of *C. tonkinensis* trees in cultivation in Yen Thinh commune in 2008.

No.	Owner	Village	DNG (cm)	Height (m)	Year cultivated
T_YT 01	Mai Thi Hanh	Mam	20	7	1997
T_YT 02	**Le Van Dat**	**"**	**18**	**7**	**1990**
T_YT 03	**Dinh Van Can**	**"**	**10**	**6**	**"**
T_YT 04	Ngo Tien Quy	Coong	10	6	"
T_YT 05	**Ngo Tien Quy**	**"**	**7**	**6**	**"**
T_YT 06	**Phan Huu Le**	**"**	**8**	**3**	**1994**
T_YT 07	Phan Van Nhung	"	8	4	1996
T_YT 08	Le Van Con	Lang	7	5	1994
T_YT 09	**Le Van Bay**	**"**	**16**	**5**	**1996**
T_YT 10	Ngo Van Truong	"	20	7	1990
T_YT 11	Le Van Tua	Ang	6	3	2002
T_YT 12	Ngo Van Luc	Coong	8	4	1994
T_YT 13	"	"	14	7	"
T_YT 14	"	"	9	5	"
T_YT 15	Ngo Tuan Lien	Mam	8	4	1995
T_YT 16	Ngo Van Trong	"	8	4	1993

Note: Boldfaced text indicates cone-bearing tree.

Appendix 4. Status of *C. tonkinensis* trees in cultivation in Van Linh commune in 2008.

No.	Owner	Village	DNG (cm)	Height (m)	Year cultivated
T_VL 01	**Luong Thi Khuya**	**Mo Cay**	**22**	**9**	**1995**
T_VL 02	**Hoang Thi Luoc**	**"**	**13**	**5**	**"**
T_VL 03	**Lam Van Si**	**Lang Dam**	**10**	**5**	**"**
T_VL 04	**Trieu Van Thanh**	**Lung Na**	**22**	**9**	**"**
T_VL 05	Hoang Van Dung	"	6	4	2007
T_VL 06	**Ho Van Thoi**	**"**	**23**	**10**	**1995**
T_VL 07	**Linh Van Thuong**	**"**	**14**	**10**	**"**
T_VL 08	Lang Van Son	Lung Tan	17	10	"
T_VL 10	Ho Van Vinh	"	6	4	2002
T_VL 11	Ho Van Su	Xa Dan	18	9	1995

Note: Boldfaced text indicates cone-bearing tree.

Nomenclature and Taxonomic Notes on *Cupressus gigantea* Cheng & Fu

From material collected in Adelaide, Australia, labelled *Cupressus torulosa* D.Don var. *majestica* Carrière, sent to China by Mao & Liu for molecular analysis, Silba (2012) got the interesting result that this variety matches the species *Cupressus gigantea* described by Cheng & Fu in 1975. This taxon was first described by Carrière in his Traité Général des Conifères (1855) from a material earlier listed in the catalogue of the Knight & Perry nursery in United Kingdom (1850).

If this taxon is considered as a variety of *Cupressus torulosa*, the correct name is therefore *Cupressus torulosa* var. *majestica* Carrière, and the combination *Cupressus torulosa* var. *gigantea* (Cheng & Fu) Farjon (2005) becomes superfluous. However, from morphological, physiological, molecular, ecological and geographical data, there is no justification to treat *Cupressus gigantea* as a variety of *Cupressus torulosa* D.Don. The two taxa are easily distinguished from one other.

Morphology

Leaves : Farjon discusses mainly shoot morphology, yet foliage in this genus is rarely easy to distinguish between the different species, with only very few exceptions such as *Cupressus macnabiana* A.Murray bis or *Cupressus funebris* Endlicher (adult foliage). Despite this, *Cupressus gigantea* can show white resin dots on adult leaves, while this has not been observed on *C. torulosa*. Foliage on saplings of *Cupressus gigantea* is typically glaucous, on *C. torulosa* green. *Seed cones* : they are easily distinguishable. *C. gigantea* cones display typical recurved umboes on the distal scales (see fig. 1), absent in *C. torulosa* (see fig. 4) ; young seed cones of *C. gigantea* close to pollination time and soon after are black (see fig. 3), the ones of *C. torulosa* are blue (see fig. 6 and 7). One year old cones of *C. torulosa* often have a whitish wax coating (see fig. 13). *Bark* : on old trees, bark of *C. gigantea* is brown or grey, with stripes usually parallel, of *C. torulosa* grey and the stripes are intertwined (compare figures 8 and 12). *Crown shape* : *C. gigantea* has a typical columnar crown shape, while *C. torulosa* has a conical one (see figures 9 and 11). From a morphology point of view, Cheng and Fu rightfully observed that *C. gigantea* is closer to *Cupressus chengiana* ("Species affinis").

Fig. 1 : Mature cone of *Cupressus gigantea*, 17.2.2013.

Physiology

Cupressus gigantea is hardier than *Cupressus torulosa*. Following the cold frost wave of the first two weeks of February 2012 in Western Europe [1], young plants of *Cupressus gigantea* were completely undamaged, even ones in containers when it is a well known fact that roots are less hardy than foliage. Seedlings of *Cupressus torulosa* on the other hand suffered in the nursery and several were killed in the same conditions.

[1] The cold wave to which the plants discussed here were subjected lasted two weeks with temperatures remaining below 0°C during the whole period, and with several lows below -10°C and a record measured at -12.6° ; moreover the damaging effects were reinforced by a strong desiccating wind and direct sunlight.

Phenology

At maturity, *C. torulosa* cones open and release their seeds 18 months after pollination, while *C. gigantea* cones remain green and closed for more than 24 months (see fig. 1, 2, 4 & 5).

Fig. 2 : *C.gigantea* 18 months after pollination. 20.6.2012.

Molecular data

Several studies are available. Although their results may appear contradictory, none is showing a close relationship between *Cupressus torulosa* and *C. gigantea*.

Rushforth *& al.* (2003 : fig. 1, p. 20) using RAPDs propose a cladogram where the closest species to *Cupressus gigantea* are *Cupressus austrotibetica* Silba and *C. duclouxiana* Hickel in Camus. Conversely, *C. torulosa* is in another clade together with *Cupressus funebris*, *C. tortulosa* Griffith [under the name *C. cashmeriana* Carrière] and *C. chengiana* S.Y.Hu.

Mu *& al.* (2006 : fig. 1, p. 351) using cpDNA (the *pet*G-*trn*P sequence) came to the conclusion that *Cupressus gigantea* is closest to *Cupressus chengiana*, while another cluster is formed by the other analysed *Cupressus* species : *Cupressus torulosa*, *Cupressus nootkatensis* D.Don [under *Chamaecyparus nootkatensis*], *Cupressus funebris* and *Cupressus duclouxiana*.

Fig. 3 : *C.gigantea*, young cones, 19.2.2011.

Xu *& al.* (2010) analysed the cpDNA of several Asiatic cypress species. Their results show that *C. torulosa* is much closer to *C. tortulosa* [under the name *C. cashmeriana*] and to *C. austrotibetica* than to *C. gigantea*. Whichever the molecular analysis, by placing this later taxon under *C. torulosa*, the species so constituted (Farjon, 2005, 2010) is paraphyletic.

Ecology

Cupressus gigantea grows in riparian habitats, north of the main Himalayan range and thus protected from the monsoon which develops its full effect on the southern slopes of the Himalaya. The average rainfall is below 800 mm/year (Zhang, 2006). It is true that a few *Cupressus torulosa* stands are facing very dry conditions, but these populations above 3000 m show no regeneration at all and look like relict groves (Karnali valley at 3400 m altitude, above Marpha). Most localities are below 3000 m (Gharwal 1600 to 2800 m, Mugu 2300 m, Nainital to 2400 m, Simla 2200 m, rainfall above 1300 mm/y). *Cupressus gigantea* grows between 3000 and 3400 m (Zhang, 2006).

Geography

Cupressus gigantea grows in southern Tibet along the Yarlung Tsangpo and its tributaries at an altitude higher than 3000 meters with a very restricted distribution range, so restricted that it is considered endangered (and even as critically endangered from one report). This region is

separated from the distribution range of *Cupressus torulosa* by the Himalayan highest summits. In a west to east direction, the distance is at least equal to 900 km in a straight line from central Nepal to the Yarlung Tsangpo shores (Nang Xian). The geographical separation of these two species is so important that inbreeding became impossible quite soon after the beginning of the Himalayan orogeny. Considering that the collision between the Indian and Asiatic tectonic plates began some 50 millions years ago (Mascle *& al.*, 1990), and even if accepting more than half of that figure for an effective separation, there is a span of time big enough for a complete speciation process to occur. Xu *& al.* (Additional File 4-fig. 2), building a phylogenetic diagram based on a molecular clock, propose a separation occurring some 20 millions years ago [2]. *Cupressus torulosa* appears in rather small isolated stands exclusively south of the Himalayan range from central Nepal to north-west India (Uttarakhand and Himachal Pradesh).

Fig. 4 & 5 : *Cupressus torulosa* cones before maturity and after seeds have been released. 10.9.2009

Taxonomy summary

Based on the observations summarised here, it is easy to distinguish both species by their morphology, physiology, phenology, DNA, ecology and geography. Given the cited molecular analysis, as already noted, if *Cupressus gigantea* is placed as variety of *Cupressus torulosa*, the group is paraphyletic, when other *Cupressus* taxa south of the Himalayan range are considered as valid species and are closer to *Cupressus torulosa* [3] than to *Cupressus gigantea*.

Cupressus gigantea W.C.Cheng & L.K.Fu, *Acta Phytotax. Sin.* 13 (4): 85 (1975).

Synonyms :

≡ *Cupressus torulosa* var. *majestica* Carrière, *Traité Général des Conifères*: 118 (1855).

≡ *Cupressus majestica* Knight & Perry, *Synopsis of the Coniferous Plants sold by Knight and Perry, Exotic Nursery, King's Road, Chelsea* : 19 (1850) [*nom. nudum*].

≡ *Cupressus torulosa* var. *gigantea* (W.C.Cheng & L.K.Fu) Farjon, *A Monograph of Cupressaceae and of Sciadopitys* : 224 (2005) [*nom. superfl.*].

Holotype and Paratypes : see Fiche Jean Hoch, page 22.

Bibliography

Carrière, A. (1855). *Traité Général des Conifères.* Chez l'auteur, Paris, France.
Cheng, W. C. & L. K. Fu (1975). *Acta Phytotaxonomica Sinica* 13 (4): 85-86.

[2] Additional File 4-figure 1 proposes a cladogram where the old world and new world *Cupressus* species form a monophyletic group, separated from the Junipers.

[3] Farjon (2005, 2010) treats *Cupressus austrotibetica* Silba as synonym of *Cupressus torulosa* D.Don when – according to the results of the cpDNA analysis (Xu *& al.*, 2010) – the former shows no difference in the nucleotide chain with *Cupressus tortulosa* Griffith [treated as *Cupressus cashmeriana* by Xu *& al.* and by Farjon], while there is one difference in the nucleotide chain between *Cupressus austrotibetica*/*tortulosa* and *Cupressus torulosa*. Again the populations placed by Farjon under *Cupressus torulosa* form a paraphyletic group.

Farjon, A. (2005). *A Monograph of Cupressaceae and of Sciadopitys*. Kew Publishing, Richmond, Surrey, UK .
Farjon, A. (2010). *A Handbook of the World's Conifers*. 2. vol., Brill, Leiden, The Netherlands.
Knight & Perry (1850). *Synopsis of the Coniferous Plants sold by Knight and Perry, Exotic Nursery, King's Road, Chelsea*. Longman & Co, London, UK.
Mascle, G., B. Delcaillau & G. Herail (1990). La formation de l'Himalaya. *La Recherche* 21 (217): 30-39
Mu, L., L. Wang, L. Yao, B. Hao & Q. Luo (2006). Application of pet G-trn P sequence to systematic study of Chinese *Cupressus* species. *Front. Biol. China* 4: 349-352.
Rushforth, K., R. P. Adams, M. Zhong, X.-qiang Ma & R. N. Pandey (2003). Variation among *Cupressus* species from the eastern hemisphere based on Random Amplified Polymorphic DNAs (RAPDs). *Biochemical Systematics and Ecology*. 31: 17-24.
Silba, J. (2012). Molecular DNA studies on some cultivated Asiatic species of *Cupressus* L. (Cupressaceae), with correspondence notes (Lanzhou, Gansu). *J. Int. Conifer Preserv. Soc.*19 (1): 1-35.
Xu, T. T., R. J. Abbott, R.I. Milne, K. Mao, F. K. Du, G. Wu, Z. Ciren, G. Miehe & J. Liu (2010). Phylogeography and allopatric divergence of cypress species (*Cupressus* L.) in the Qinghai-Tibetan Plateau and adjacent Regions. *BMC Evolutionary Biology* 10: 194, 10 pages, with additional graphs and tables.
Zhang, G. (2012). Studies on the Biological and Ecological Characteristics of Endangered Plant *Cupressus gigantea* in Tibet. *Forestry Science & Technology* 31 (2): 1-5.

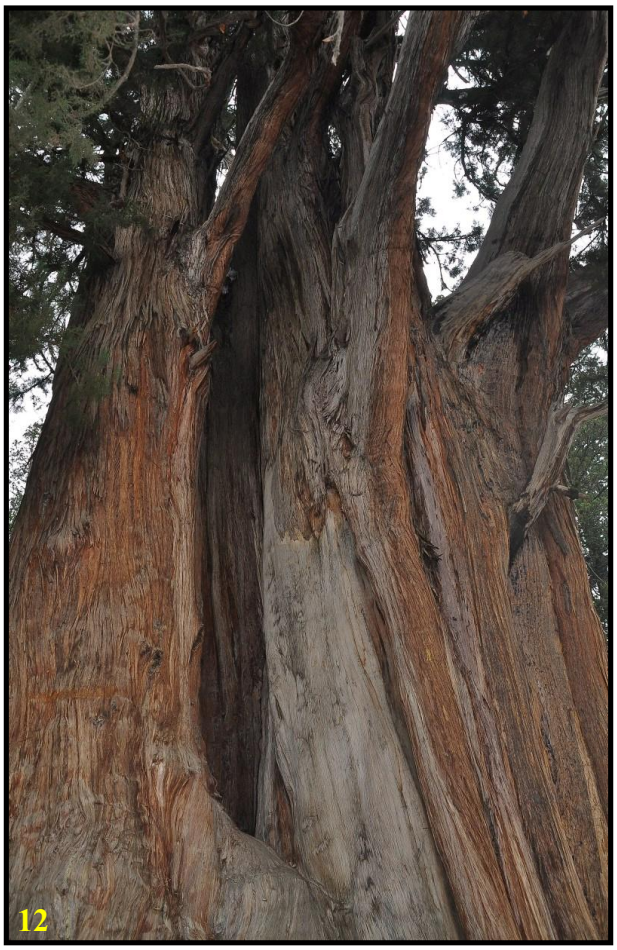
Fig. 6 & 7 : *Cupressus torulosa*, seed cones two months and a half after pollination time (left : Chèvreloup 13.4.2011), and 3 to 4 months old seed cones (centre : Villa Thuret 29.4.2009). The blue colour of the young cones remains clearly visible several months after the pollination.

Fig. 8 : Bark of *C.torulosa*

Fig. 9 : *C.gigantea* grove, Xizang, China

Photo credit :
Fig. 9, 10 & 12 :
© Harry Jans
www.jansalpines.com

Fig. 10 & 12 : *C.gigantea*, near Nyingchi, Xizang, China. Fig. 11 & 13 : *C.torulosa*, cultivated, Italy.



Cupressus gigantea W. C. Cheng & L. K Fu

Acta Phytotax. Sin. 13 (4): 85 (1975)

巨柏 ju bai, Cyprès géant, Tibetan Cypress

Tibet (Xizang), Préfecture de Línzhī Di Qu, vallée du Yălŭ Zàngbù Jiāng.

District (sous préfecture) de Lăng Xiàn

coll. *Qinghai-Xizang Exped. n° 3318* **Holotype**, 21-09-1974, 22 km à l'ouest de Jiăgé (Mĭlín Xiàn), dans l'est du district de Lăng Xiàn, 3000 m. Versant sud, sur sol sablonneux, sporadique, arbre de haute futaie.
PE00014363, PE00042975, PE00053433

coll. *Guo Benzhao & Wang Weiyi, n° 23061*, 21-08-1977, Lăng Xiàn, 3300 m.
HNWP67778, WUK344172

coll. *Qinghai-Xizang Exped. n° 750(7 ou 9)63*, 27-07-1975, Lăng Xiàn, 3200 m. Bords de rivière, sur sols sablonneux.
HNWP96350, HNWP51393

District (sous préfecture) de Línzhī Xiàn (Nyingchi) 林芝

coll. *Zhang Jing Wei & Wang Jin Ting n° 61* **Paratype**, 11-05-1966, Línzhī Xiàn, au nord-est à environ 1 km de Bajié xiang, versant sud-ouest, 3150 m. Hauteur 30 à 45 m. Diam. 0,9 m. survivant, nom local Cyprès rond (Yuan bai).
PE00014367, PE00042977

coll. *Ni Zhicheng & Wang Yongze, Ci Duo, Ci Dan, n° 1753*, 20-09-1980, près de Línzhī city, 3100 m. Hauteur 35-45 m. diam. 1,5-3 m.
PE00014362, PE00014366, PE00063413

coll. *China coll. n° 15723*, 20-09-1980, Línzhī Xiàn, du canton de Línzhī au canton de Bayi, 3100 m. versant ensoleillé, en petit peuplement. H. 15-20 m.
PE00063424, 25, 26, 27, 28, 29, 30.

coll. *Lang Kaiyong & Li Bosheng n° 1520*, 21-05-1986, Línzhī Xiàn, au pont de Zhouga, à mi-monts 3100 m.
PE00026744, 46

coll. *Ni Zhicheng, Ci Duo, Ci Dan n° 3211*, 03-09-1982, Línzhī Xiàn, canton de Bayi près de Jinxing, 3100-3300 m.
PE00026745.

District (sous préfecture) de Mĭlín Xiàn

coll. *Xizang médicinal plants Team, n° 4314* **Paratype**, 03-08-1972. Mĭlín Xiàn, bourg de Jiăgé, sur les versants vers le village de Pentoulian, 3000 m. Hauteur 30 m. diam. 1 m.
PE00042976, PE00017910, HNWP82790

coll. *Huang Rongfu, n° CG-89-369*, 09-09-1989, Mĭlín Xiàn, domaine forestier de Hongwei, 3100 m.
HNWP155888, 89

Pollen Cone Phenology
of *Wollemia nobilis* W.G.Jones, K.D.Hill & J.M.Allen

Photo Gallery by Matthias Tega

19 August 2012

5 September 2012

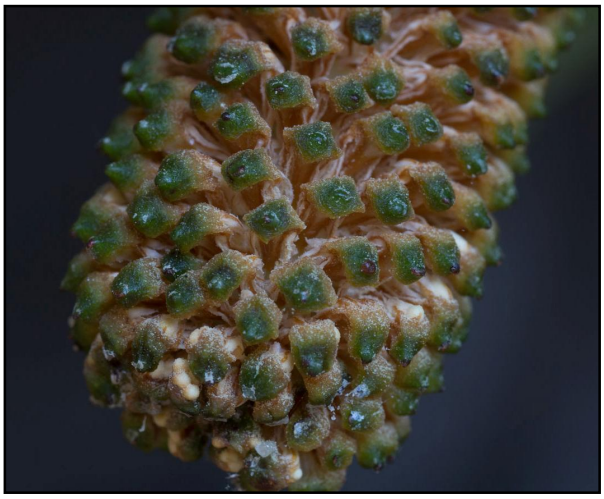
10 October 2012

10 February 2013

25 February 2013

1st March 2013

3 March 2013



19 April 2013

Cultivated specimen in **northern Italy**.

19.8.2012 : height of tree : 2.20 m.
10.2.2013 : cone length : 54 mm ; diam. : 13 to 16 mm.
25.2.2013 : maturing cone with colour change.
1.3.2013 : mature cone beginning to release pollen ;
cone length : 75 mm ; max. diameter : 21 mm.
3.3.2013 : empty cone after pollen release.
19.4.2013 : dry male cone.
Weight of pollen collected from one cone : 1.264 grams.

Pages 23-24 : all photos © Matthias Tega.

Page 25 : CCP.

Paris, France.
As it appears on this cultivated specimen, *Wollemia nobilis* is a monoecious species. In the Araucariaceae, the related genus *Agathis* is also usually monoecious, while the third genus of the family, *Araucaria* is mainly dioecious.

Cultivated specimen, Paris, France (8.5.2013).

Authentic Documentation on the Seedling Embryology of *Cupressus torulosa* D.Don from Natural Populations in India

The seedling embryology of *Cupressus torulosa* D.Don (Cupressaceae) from India has been much confused in the literature by many authors on an international scale for well over 100 years. The initial confusion began when botanists T. G. Hill and E. de Fraine (1908) published a detailed account on the cotyledon anatomy of *Cupressus torulosa* and claiming that *Cupressus torulosa* had 3 to 5 cotyledons in its seedlings. However, there is no documentation on where Hill and de Fraine obtained their test seed from, and as it probably came from cultivated trees in England, then it is likely that the *Cupressus* trees they obtained seed from where actually cultivated trees of *Cupressus lusitanica* Miller, a *Cupressus* species that has long been mislabeled as *Cupressus torulosa* in cultivation in many countries. Subsequently, many authors have copied Hill and de Fraine's wrong information in many journals on an international scale, and even up to modern times (de Laubenfels *et al.*, 2012).

Finally, authentic wild collected seed of *Cupressus torulosa* from India was collected by Alexander Nijman (Leidschendam, The Netherlands). Nijman spent several weeks collecting *Cupressus torulosa* in November 2011 in the Kalamuni area, near Munsiyari, in north-east Uttarakhand, and collected authentic *Cupressus torulosa* seed from this area at 2500 metres altitude with a local guide from India, Narendra Kumar (Adventure Trekking Company), with its office near Munsiyari as well. The forest of *Cupressus torulosa* at Kalamuni is an old growth forest, probably one of the few old growth forests of true *Cupressus torulosa* still intact and undisturbed by timber harvesting, though some timber harvesting does occur in the area. The trees of *Cupressus torulosa* at Kalamuni are known to be between 300 to 400 years old, 40 to 50 metres tall, conical in outline and with large trunk diameters up to a metre or more in diameter (see fig. 7 to 12). Trunk diameters of up to two metres or more in diameter were reported by early writers to the Himalayas in the 1800's (Gordon, 1858). The Kalamuni area is in the Pithoragarh District of north-east Uttarakhand. Recent herbarium collections by botanists in Germany confirm the authenticity of the Kalamuni locality. These herbarium collections are :

- India, Munsiyari, Uttaranchal, Kumaon Gori, 2330 metres, *B. Dickore 19713* (MSB);
- India, Munsiari, Jaltha, Uttaranchal, Kumaon Gori, 2050 metres, *B. Dickore 20009* (MSB);
- India, Pato Temple, Uttaranchal, Kumaon Gori, 2140 metres, *B. Dickore 20263* (MSB).

This last collection may be cultivated though. Unfortunately, Nijman made no herbarium collections of *Cupressus torulosa* from Kalamuni, but he did collect numerous seed at 2500 metres altitude. Subsequently, this seed from Kalamuni was tested and sent to several botanic gardens in the United States, including the Montgomery Botanical Garden, University of Florida, Gainesville, Quarryhill Botanic Garden and others. Chad Husby and Adam Black, enthusiatic collectors in Florida, photographed the seedlings and cotyledons and confirmed that authentic *Cupressus torulosa* from India has only two bluntly acute cotyledons, the cotyledons being about 9-11 mm. long, and about 1.5 mm wide or more (see photo by A. Black). Interestingly, the Indian author, R. S. Troup (1921) had first recorded *Cupressus torulosa* with only two cotyledons, and illustrated it in his classical three volume text on *The Silviculture of Indian Trees*, but no modern author seemed to be aware of Troup's account (including Eckenwalder, 2009 and Farjon, 2005), and both these authors give a totally wrong description of botanical features of true *Cupressus torulosa* in all their manuscripts on conifers (per de Laubenfels *et al.* 2012).

Prior to this information from the Nijman collection from Kalamuni, I had been convinced that *Cupressus torulosa* (Indian populations only, not Nepalese populations) had 3 to 5 cotyledons as true origin seedlings. This was because earlier (Silba, 2005) I had obtained reportedly wild collected seed from India from several noted individual botanists in Europe who custom collected seed for me several times in the past from India, and all these seed collections produced seedlings with 3 to 5

[1] Alumni Professor, SUNY- Farmingdale, New York. Current address : Palm Coast, Florida.
Corresponding Consultant: Adam Black, Forest Pathology Department, University of Florida, Gainesville, Florida.

cotyledons. Notably, a local collector, Mrs Suri, in the Almora hills, Nainital area, who collected wild-sourced seed for Chris Chadwell (England); all her "*Cupressus torulosa*" seed turned out to bear 3 to 5 cotyledons. Also, since Hill & de Fraine early (1908) published detailed anatomical notes on *Cupressus torulosa* having 3 to 5 cotyledons, which was also accepted by French botanists A. Camus and H. Gaussen (Toulouse, France). In addition, in a mathematical analysis, I had not imagined or figured out how Indian tree seed companies could be selling kilogram quantities of seed of "*Cupressus torulosa*", if this seed was not from native stands in India, but from forestry plantations or naturalised populations of *Cupressus lusitanica,* introduced at an early date. Yet, it seems that *Cupressus lusitanica* is a biological threat now in modern India. Indeed, *Cupressus lusitanica* has become invasive in parts of India, and has replaced some of the native stands of former pure *Cupressus torulosa* forests. I was told by foresters in India (Manoj Chandran, Deputy Conservator, Pithoragarh District) that even the peak of Nainital itself, where pure forests of true *Cupressus torulosa* once occurred, is now all inter-mingled with plantations and naturalised populations of *Cupressus lusitanica*. Thus, *Cupressus lusitanica* is now a biological hazard and a threat to the few remaining natural populations of *Cupressus* in India itself.

All other Chinese species and Nepal populations of *Cupressus* have two cotyledons from their seedlings. I know this from personal observations and seed trial from wild populations I obtained myself and from local colleagues over the years. I obtained authentic seed of *Cupressus torulosa* subsp. *karnaliensis* (Silba) Silba from Tony Schilling, formerly of Wakehurst Place in England, who collected wild seed from near Marpha, Central Nepal ; all his seedlings bore two obtuse cotyledons (a few millimeters shorter and broader than the Kalamuni accessions). Therefore, we would think that the probability factors of *Cupressus* in India should be that all natural wild Indian populations of *Cupressus* must have only two cotyledons (*Cupressus torulosa* and *Cupressus assamica*). Indeed, recent herbarium collections of *Cupressus assamica* Silba by Rushforth from the wild locality on Mount Piri in Arunachal Pradesh have only yielded two cotyledons in their seedlings as well (Silba, 2012). Yet, earlier material I obtained from Arunachal Pradesh turned out to be cultivated trees of *Cupressus lusitanica* Mill., and those cultivated early at the Hillier Arboretum and Atlanta Botanical Garden from Silba's seed from Arunachal Pradesh all proved to be *Cupressus lusitanica* with 3 to 5 cotyledons. Keith Rushforth's recent collections from Mount Piri at RBG Edinburgh (E) prove that *Cupressus assamica* is a true Asiatic species of *Cupressus*, with two typical cotyledons. Interestingly, Jeff Bisbee had early obtained authentic wild seed of *Cupressus torulosa* from a herbarium collection of Zsolt Debreczy and Istvan Rácz in the Budapest (Hungary) Museum (BP). This recent collection is : India, Shimla District, near village of Mazhana, disturbed forest dominated by *Cedrus deodora*, 2130 metres elevation, *I.Rácz & B.S.Thakur 70232-B* (BP); hoc location, *I.Rácz & B.S.Thakur 70232-X* (BP) of which Debreczy and Rácz sent me photographs of their herbarium collections and fragments of these herbarium collections directly to me in Florida. Rácz estimated that approximately ten thousand trees of *Cupressus torulosa* with relatively small trunk diameters (to moderate trunk diameters) exist at this site alone in Shimla, near Mazhana – so *Cupressus torulosa* may not be threatened at this locality in the north of the range of *Cupressus torulosa*. Recently, Adam Black was sent cuttings from Bisbee through my efforts to propagate the plant at Bisbee's collection as *I.Rácz and B.S.Thakur 70232*, so that may be the only second wild accession of true *Cupressus torulosa* from India now in cultivation (see fig. 4 & 5).

Recently, Christopher Chadwell (England) collected *Cupressus torulosa* from wild populations from Kumaon, and his seed is in cultivation at Knightshayes Botanic Garden in England. However, Chadwell's earlier collections, in cultivation at Hillier Gardens, and supposedly from wild populations in India, all turned out to be *Cupressus lusitanica*. *Cupressus lusitanica* has been in cultivation in Portugal for more than 400 or 500 years now, introduced from a population in southern Mexico. It is possible that *Cupressus lusitanica* has also been cultivated in India itself for perhaps than 300 to 500 years as well. This is a question that needs to be studied further.

At Stanford University, near Palo Alto, California is a cultivated tree of *Cupressus torulosa* planted in 1890, with no locality details. The Stanford tree most likely came from India itself, because at that early date in 1890 *Cupressus* was not yet collected from Nepal (the Nepal populations were collected much later in history). Now, the Stanford *Cupressus* specimen is an isolated tree bearing numerous cones and some 20 to 23 m tall now. Silba collected numerous herbarium specimens from the Stanford tree (*Silba B-632*, August 2009, NY) and widely distributed this

specimen. Interestingly, when I sent pressed herbarium specimens to de Laubenfels himself, he initially claimed it was *Cupressus lusitanica* or *Cupressus arizonica* and claimed it was not *Cupressus torulosa* as the branches did not appear to be "matted". Yet, Chad Husby in Miami germinated several seedlings of *Silba B-632* (NY) and these all had only two obtuse cotyledons, and thus the tree at Stanford is authentic *Cupressus torulosa* without a question. Therefore, I sent duplicate herbarium collections of *Silba B-632* to de Laubenfels a second time, and he then commented "the branches do appear to be "matted" and thus it must be *Cupressus torulosa*". The *Silba B-632* accession is now in cultivation in Florida and is hoped to be distributed to other botanic gardens in due course.

The recent manuscript by de Laubenfels *et al.* (2012) claims that *Cupressus torulosa* has "dimorphic leaves" whereas true *Cupressus lusitanica* has "monomorphic leaves". I am not sure these characteristics are true or consistent, as it seems from the Stanford University specimem cited above, that de Laubenfels (now retired from Syracuse University) has much difficulty distinguishing these two species even himself. The other recent claim by de Laubenfels (2012) that most herbarium specimens cited under the distribution of *Cupressus torulosa* D.Don given by J. Franco (1941) are really *Cupressus lusitanica*, is based only on questionable circumstantial evidence itself. I believe the true distribution in India of *Cupressus torulosa* itself will only be resolved by looking at all these old and recent herbarium collections from northwest India and Arunachal Pradesh at high magnification under the electron microscope. Even molecular DNA studies are often based on the minimal amount of samples, and whereas molecular data should be gathered from more several samples as a quantative analysis from a broad range of the species thus concerned. Claims by de Laubenfels that most herbarium collections from India are all *Cupressus lusitanica* does not seem to be totally true. Certainly, most if not all Indian tree seed companies are only offering naturalised seed of *Cupressus lusitanica*, and indeed selling bulk quantities of *Cupressus lusitanica* seed as *Cupressus "torulosa*" to other commercial seed companies in Europe, Australia and the USA. Furthermore, most of the commercial seed sold in India as *Cupressus cashmeriana* Carrière (the correct name for this species is *Cupressus tortulosa* Griffith) is actually *Cupressus lusitanica*.

Bibliography

Camus, A. (1914). *Les Cyprès, (genre* Cupressus*)*. P. Lechevalier, Paris, France

Debreczy, Z. & I. Rácz (2011). *Conifers Around the World.* DendroPress, Budapest, Hungary.

de Laubenfels, D. J., C. E. Husby & M. P. Griffith (2012). Further nomenclatural action for the Cypresses (Cupressaceae). *Novon* 22: 8-15.

Eckenwalder, J. E. (2009). *Conifers of the World.* Timber Press, Portland, Oregon, USA.

Farjon, A. (2005). *A Monograph of Cupressaceae and of Sciadopitys*. Royal Botanic Gardens, Kew, England.

Hill, T. G. & E. de Fraine (1908). On the seedling structure of Gymnosperms. *Ann. Bot. (Oxford)* 22: 689-712.

Majumder, S., A. D'Rozario & S. Bera (2010). Vivipary in Indian Cupressaceae and its Ecological Consideration. *Int. J. Bot.* 6: 59-63.

Manoj Chandran (2008). Some Plants of Taxonomic and High Conservation Status in Uttarakhand Himalaya. *In:* Rawat, G. S. (Ed.). Special Habitats and Threatened Plants of India. *ENVIS Bulletin: Wildlife and Protected Areas* 11 (1): 45-49. Wildlife Institute of India, Dehradun, India.

Silba, J. (2005). A monograph of the genus *Cupressus* L. in the twenty-first century. *J. Int. Conifer Preserve Soc.* 12: 31-103.

Silba, J. (2012). Molecular DNA studies on some cultivated Asiatic species of *Cupressus* L. (Cupressaceae), with correspondance from Dr. K.S. Mao, Gansu. *J. Int. Conifer Preserve Soc.* 19: 1-35.

Troup, R. S. (1921) *The Silviculture of Indian Trees.* 3 volumes. Dehra Dun, India.

Fig. 1 : *Cupressus torulosa*, *J. Duthie 21034* (LY) Bamsu Valley, northwest India, 2134 meters, Courtesty of Mélanie Thiébaut, University of Lyon Herbarium (LY), Lyon, France.

Fig. 2 : *J. Duthie 21034* (LY), photograph of herbarium collection details. Each segment of bar graph equals one millimeter long.

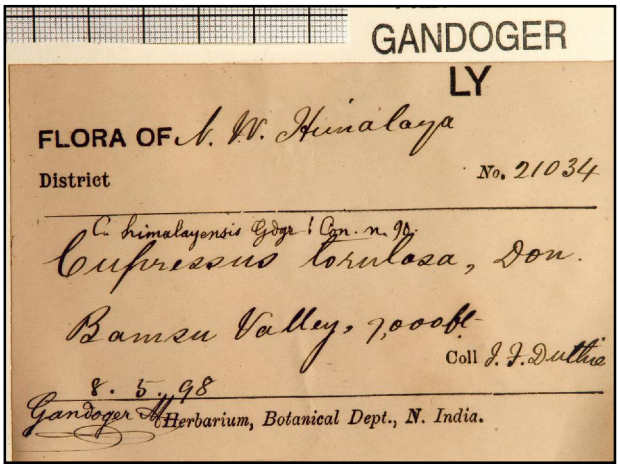


Fig. 3 & 4 : *Cupressus torulosa* seedling. Same specimen cultivated by Jeff Bisbee at different times from *I.Rácz & B.S.Thakur 70232*.

Fig. 5 : *A. Nijman s.n.*, from Kalamuni, India, 2500 meters, University of Florida, Gainesville, Florida. Photo by Adam Black.

Fig. 6 : *Cupressus torulosa*, seedling with two cotyledons, *Alexander Nijman s.n.*, Kalamuni area, cultivated, University of Florida, Gainesville. Photo by Adam Black.

Fig. 7 & 8 : Habitat with *Cupressus torulosa* and *Abies pindrow* as dominant trees ; road to Kalamuni pass, Uttarakhand, India. The tallest trees are mostly *Cupressus torulosa*. Also abundant evergreen *Quercus semecarpifolia*. and some *Trachycarpus takil* here. November 2011. Photos by A. Nijman.

Fig. 9 : Branch of *Cupressus torulosa* with cones. Near Kalamuni pass, Uttarakhand, India. April 2010. Photo by A. Nijman.

Photos page 31.
Fig. 10, 11 & 12 : *Cupressus torulosa* in wild habitat, near Kalamuni pass, Uttarakhand, India.

Trachycarpus takil in foreground on fig. 10.

Photos by A. Nijman.

Fig. 13 : *Cupressus torulosa*, cultivated Stanford University, near Palo Alto, Stanford University, California, tree planted in 1890, *Silba B-632* (NY). Photo by J. Silba.

Notes on a possible new southern locality of *Cupressus bakeri* Jepson

ABSTRACT

In July 2010 by way of correspondence, Joey Malone reported to J. Silba an undocumented report of a sighting of a grove of *Cupressus bakeri* Jeps. far to the south of the currently known range of *Cupressus bakeri*. If the report is true it would extend the known range of *Cupressus bakeri* a considerable distance to the south of its known range.

In correspondence, Joey Malone (Oakland, California), who has photographed and visited many other groves of *Cupressus bakeri* in northern California, wrote to J. Silba (8 July 2010) : "I was told by a lady at the Nevada Department of Forestry, Washoe Valley, who supposedly collected seed from this stand, that there is a stand of *Cupressus bakeri* near Sierraville, off Highway 89. I have called the Ranger in Sierraville and they have never heard of any stand of *Cupressus bakeri* nearby. The lady I spoke to cannot remember the exact location of the stand as it was years ago and the gentlemen who took her there to collect seed has long since retired."

Some other recent discoveries of rare groves of *Cupressus bakeri* include that discovered in Tehama County, near south side of Cub Creek, on the east side of Deer Creek Canyon, between Potato Patch and Alder Creek Campgrounds, 1341 meters, a dozen trees seen here, trees 15-20 m. tall, *J.Ost & S.Sayre s.n.* (CHSC 68566) in the Chico State Herbarium, California, collected in 1997. For additional data on flora of Tehama County see Griffin & Stone (1967).

Naturalist and botanical photographer Jeff Bisbee (Gardnerville, Nevada) had these notes to J. Silba to add (24 September 2012, pers. comm.) :

"Sierra Valley would be very consistent with the plant communities and climate of other *Cupressus bakeri* groves. About the trees at Mud Lake and Mount Wheeler being more hardy, well they certainly get much more snow at those locations, but may not be any colder than other stands, especially those east of the Cascade Mountains like the ones on Goosenest Mountain and Timbered Crater. These locations can be quite cold in winter, well below zero Fahrenheit [-18° C]. *Cupressus bakeri* should be quite hardy, no matter what source, since they all are in cold, interior areas of northern California and Oregon. Most of the Mud Lake stand burned several years ago in the "Moonlight Fire". I found only a few trees that survived that fire. The regeneration was very good with thousands of small seedlings coming up. This fire did not affect the nearby Mount Wheeler population, which is said to have some much older and larger trees. I have never been up to that location, and should try to photograph them one day. Also, two years ago I was speaking to the woman who "manned" the lookout on Lake Mountain, in Siskiyou County, and she said that they had just discovered *Cupressus bakeri* on Lake Mountain and pointed to the area where they were found, a red, serpentine area of the mountain, that looks very similar to the Seiad Creek population."

Recent further communications from John Copeland (Nevada Division of Forestry, Carson City, Nevada) with J. Silba indicate that a Mr Dan Greytak (now retired) was the person at the Nevada Division of Forestry's Washoe Nursery that made the original report about *Cupressus bakeri* occuring near Sierraville and this report was made some time ago (not recently). It was further reported that a Mrs Gail Durham (also of the Division of Forestry, Carson City), who lives in Nevada, has current plantings of *Cupressus bakeri* on her residential property (the trees are in fact now producing cones) in Nevada that were originally obtained from the Washoe Nursery and possibly from Dan Greytak's seed collection from Sierraville. These cultivated trees of Mrs Durham should be tested by chemotaxonomic analysis to see if they are indeed different

from other *Cupressus bakeri* populations, or if they originated from other known *Cupressus bakeri* groves in northern California.

In a personal communication to J. Silba, John Copeland of the Nevada Division of Forestry in Carson City adds (pers. comm., 26 November 2012) :

"There may well be a native grove of Baker Cypress (HEBAS) in the Sierraville area. The closest population I'm aware of is about 65 km [40 miles] north of there in Wilcox Valley / Eisenheimer Peak area of Plumas County. Alternatively, it may be that the reported trees were obtained from the Division of Forestry's Washoe Nursery and out-planted 20 to 30 years ago. The nursery has been growing HEBAS (lot number) from seed since the mid to late 1980s. HEBAS grown at the Washoe Lake facility has done well in western Nevada and has been out planted in several eastern California and northern/central Nevada communities over the years".

This information by Mr. Copeland is of further interest, because the Wilcox Valley / Eisenheimer Peak locality does not appear to be recorded in any current literature, and is not known to myself or perhaps not to recent collectors, and probably not to Mr. Jeff Bisbee either. Indeed, I do not know if any herbarium specimens of *Cupressus bakeri* have ever been collected from the Wilcox Valley / Eisenheimer Peak locality just yet.

Sierraville is in the Sierra Valley, in Sierra County, the actual town of Sierraville being located at 39.594 latitude North and 120.282 longitude West; the elevation in the immediate area is about 1500 m [4,950 feet] and the Tahoe National Forest is nearby (California Gazetteer, internet, 2012). The next step is to try and contact a local forester in the area : Sierraville Ranger District, Tahoe National Forest, Sierraville, California 92126 USA, telephone (530) 944-3401, and to find out of any further recent reports of *Cupressus bakeri* in the Sierraville area.

Of further interest is the relatively recent discovery of *Cupressus bakeri* in disjunct groves in Plumas County, California. These two groves in Plumas County, one on Mud Lake and the other on Wheeler Peak, are probably the highest elevation groves of *Cupressus bakeri*. Baker Cypress trees occur as high as 1980 and 2100 m [6,500 and 6,900 feet] in these two groves. Seed from the Plumas County stand has been cultivated at the Arnold Arboretum in Jamaica Plain, Massachussetts (USA), and this seed lot could prove more cold or winter hardy than other groves. For additional information on *Cupressus bakeri* in Plumas County, see Griffin & Critchfield (1972).

References :

Griffin, J. & C. Stone (1967). MacNab Cypress in northern California: a geographical review. *Madroño* 19: 19-27.
Griffin, J. & W. Critchfield (1972). *The distribution of forest trees in California*. US Forest Service, Berkeley, California.

Fig. 1 & 2 : Variability of the bark of *Cupressus bakeri*. Mud Lake, Plumas National Forest, Plumas County, California, USA. Photos by Jeff Bisbee.

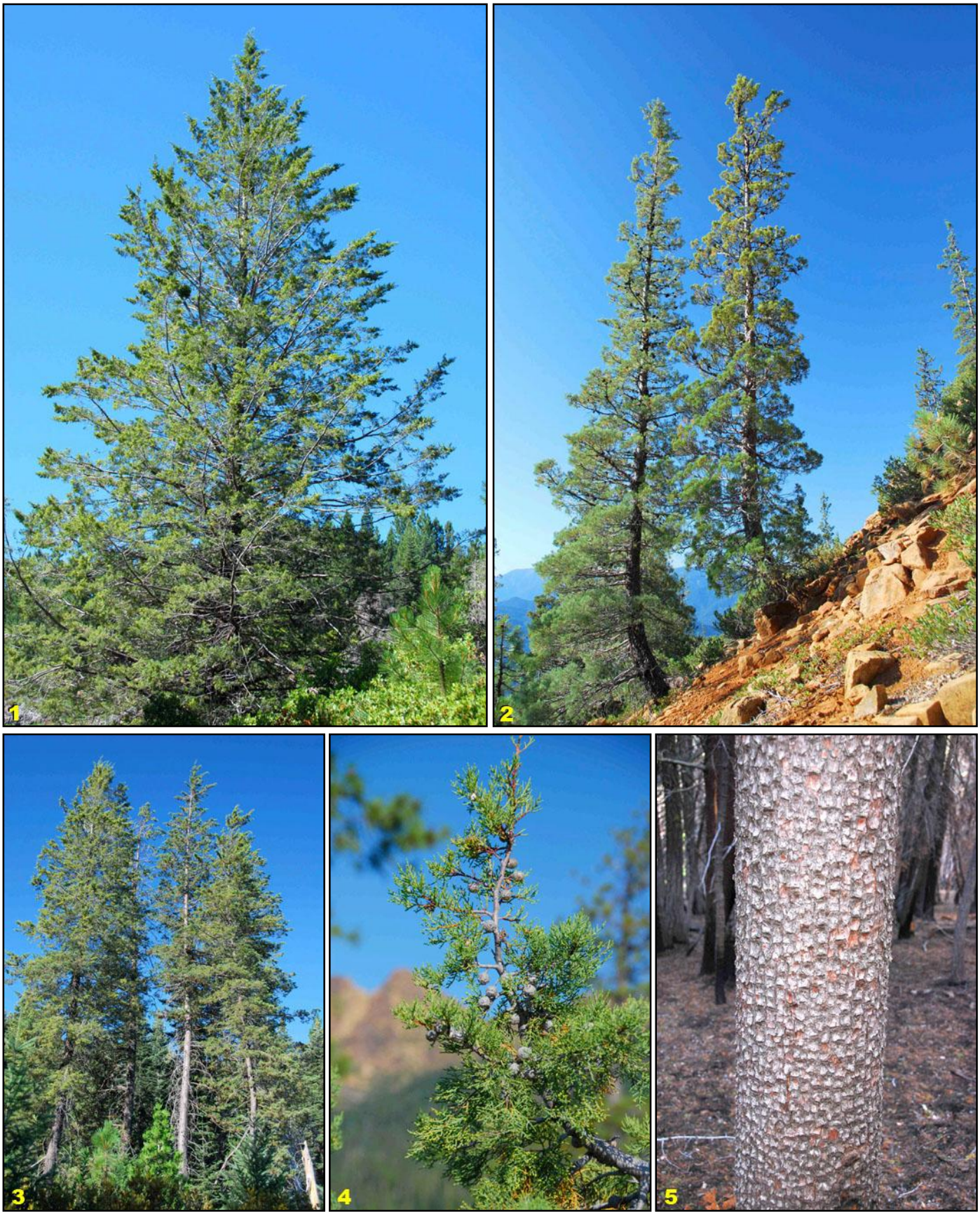
Bull. CCP 2 (1): 34-35. (6.2013)

Jeff Bisbee

Cupressus bakeri Jepson 1909

BAKER CYPRESS

California & Oregon, USA.



Seiad Creek, Siskiyou Co. 2, 8, 12 – Red Buttes, Siskiyou Co. 4
Cypress Camp, Lassen Co. 1, 3, 6, 7 – Burney Mt. Lassen Co. 11
Mud Lake, Plumas Co. 5, 9, 10

Growing with *Picea breweriana* on right of photo 12.

 (Continued from page 9.) **Jeff Bisbee**

Cupressus nootkatensis D.Don 1824

NOOTKA CYPRESS

Bear Lake, Siskiyou County, California, USA.