



Bulletin of the ***Cupressus*** **Conservation Project**

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© **Cover photo** : **Tom Hamilton** : *Cupressus glabra* in its natural habitat on the Boynton Trail, close to Sedona, Yavapai County, Arizona, USA. Note the foliage colour.

Morphological diversity of Arizona Cypress (*Cupressus glabra*) at Sedona, Arizona

This report is about morphological diversity in the Arizona Cypress population in the Sedona, Arizona area. I was there for a hiking vacation in June of 2013 with my wife and while there documented what we saw in the way of Arizona Cypress there.

I am well familiar with *Cupressus arizonica* Greene, the Rough-barked Arizona Cypress, having been on two seed collection expeditions to the trees in the Chisos Mountains in Big Bend National Park, Texas, and having also seen these cypresses at the Chiricahua National Monument, Arizona. I was looking forward to seeing *Cupressus glabra* Sudworth, the Smooth-barked Arizona Cypress, at Sedona in the wild, as there seemed to be some confusion as to where *Cupressus arizonica* ends and where *Cupressus glabra* begins. I had already discovered that some of the published data about these trees was incorrect. Notably, the cones of *Cupressus arizonica* at Big Bend did not exhibit serotinous behavior as often described. The mature cones of the trees in the Chisos Mountains open in early fall and begin dropping their seeds. By late October, over 85% of mature seeds have fallen. Similar behavior appears to be occurring with the cypresses in the Chiricahua National Monument. A trip is planned this coming fall to verify this. As expected, at both Big Bend and Chiricahua, the rough-bark cypress trees do not have exfoliating bark. Peeling, shreddy, bark on the trunk that exfoliates is not a characteristic of *Cupressus arizonica* but is for *Cupressus glabra*. Both in the Chisos and in the Chiricahuas, the populations of cypresses were remarkably homogenous in their traits, and little variation was observed.

On our first day at Sedona we hiked the two sections of the Arizona Cypress trail along the upper reaches of Dry Creek and its tributaries. Trail #1 consisted surprisingly of mostly rough-barked cypresses. Trail #2 consisted of rough-barked cypresses and semi-peeling smooth red bark cypresses. The cypresses found in both of these trails were all *Cupressus glabra*. Both the larger cone size and structure, and the exfoliating nature of even the rougher bark, as well as the more glaucous blue-gray foliage, showed these trees to be *Cupressus glabra*, not *Cupressus arizonica*. This means that *Cupressus glabra* exhibits bark conditions all the way from rough to smooth. This also indicates that correct identification of *Cupressus arizonica* is more difficult than sometimes suggested, and that many specimens previously identified as *Cupressus arizonica* may actually be *Cupressus glabra* exhibiting a rough-bark form. Pictures from the trails are attached, as is a trail map to show various locations in the Sedona area.

Day two took us to the Soldier Pass Trail, the Brins Meadow Trail, and finally the Cibola Pass Trails. The trees at the Soldier Pass Trail were approximately 15% rough-barked, 15% green smooth bark, 30% semi-peeling smooth red bark, 10% orange smooth bark, and 30% pale gray, flaky bark. The trees on the Brins Meadow and Cibola Pass Trails were 10% green smooth bark, 50% pale gray flaky bark, 40 % semi-peeling smooth red bark. All these trees were *Cupressus glabra*, identified by cone size and structure, and the exfoliating nature of the trunk bark. The foliage color was generally glaucous blue-gray-green to blue-green. It was noted that very few cones were noted on both the smooth green and orange bark trees when compared to the rougher-barked and semi-peeling smooth red-bark trees.

On our fourth day there, we collected seeds from trees on the lower part of Dry Creek at Highway 89A. The cypresses there were semi-peeling smooth red bark cypresses (see attached pictures).

The cypress trees along the Boynton Canyon Trail and at Slide Rock State Park were observed to be rough-barked *Cupressus glabra*. See the attached pictures for trees noted on this trail.

The final trail examined for cypresses was the Baldwin Trail. The cypresses there were a mixture of rough-barked *Cupressus glabra* and red and green smooth bark *Cupressus glabra* (picture attached).

Overall, the following bark forms of *Cupressus glabra* were noted :

Rough-bark – noted in ~ 50% of the cypresses. This bark form exfoliates in flaky, shreddy, or alligator/blocky forms. Foliage color varied from glaucous blue-gray to dull gray-green. Cones ranged to larger than *Cupressus arizonica*. This was the most prolific cone bearing form noted.

Semi-peeling smooth red bark – noted in ~ 35% of cypresses observed in the wild at Sedona. Foliage color was as above but less likely to be dull gray-green. Cone size was as above. Prolific cone production noted in these trees, but not quite as much as the rough-bark forms.

Smooth pale gray flaky – noted in about 10% of the cypresses over-all. Foliage color seemed consistently glaucous blue-gray to glaucous blue-green. Seed cone production was not as prolific as either of the two forms above.

Smooth green flaky – about 3% of cypresses in the area. Sparse seed cone production. Foliage color was glaucous blue-gray foliage.

Multi-color smooth bark (orange, etc) – ~ 2% of cypresses. Blue-gray glaucous foliage color. Very sparse seed cone production noted.

Summary :

Cupressus glabra bark forms in the Sedona, Arizona cypress population ranges from rough-bark to smooth-bark forms. Foliage color ranges from glaucous blue-gray to dull gray-green. Both seed cone size and the exfoliating nature of the trunk bark (even when rough) indicated that these trees are all *Cupressus glabra*. These cypresses exhibited far greater morphological diversity than the much more homogenous *Cupressus arizonica* populations found at both Big Bend National Park and the Chiricahua National Monument.

The *Cupressus glabra* in the Sedona area also did not show serotinous characteristics as is often described in literature. Well over 85% of the mature cones noted in the June trip had shed their seeds. Only a few cones were noted that were open but still retained some seeds inside. Several areas were noted as having young seedling cypresses growing, but no evidence of recent fire activity was noted in the area. The Brins Meadow Trail (higher elevation) did show signs of a fire in recent years and several spots were noted as having young cypresses growing around a dead burned tree. But in general far more young cypresses were noted in areas with no visible signs of fire activity. Perhaps the 2 year maturation span of *Cupressus glabra* cones is responsible for the belief that they are serotinous.

The *Cupressus glabra* cypresses at Sedona are full of diversity. Compared to the homogenous populations of *Cupressus arizonica*, the diversity is rather amazing. Specific traits seem to predominate in specific areas, indicating that these traits are limited to the trees of that area. The full potential for future cultivars and the full impact of the genetic diversity here will require additional study to more fully understand.

2014

Map 1: Trails in the Sedona area mentioned in the report.

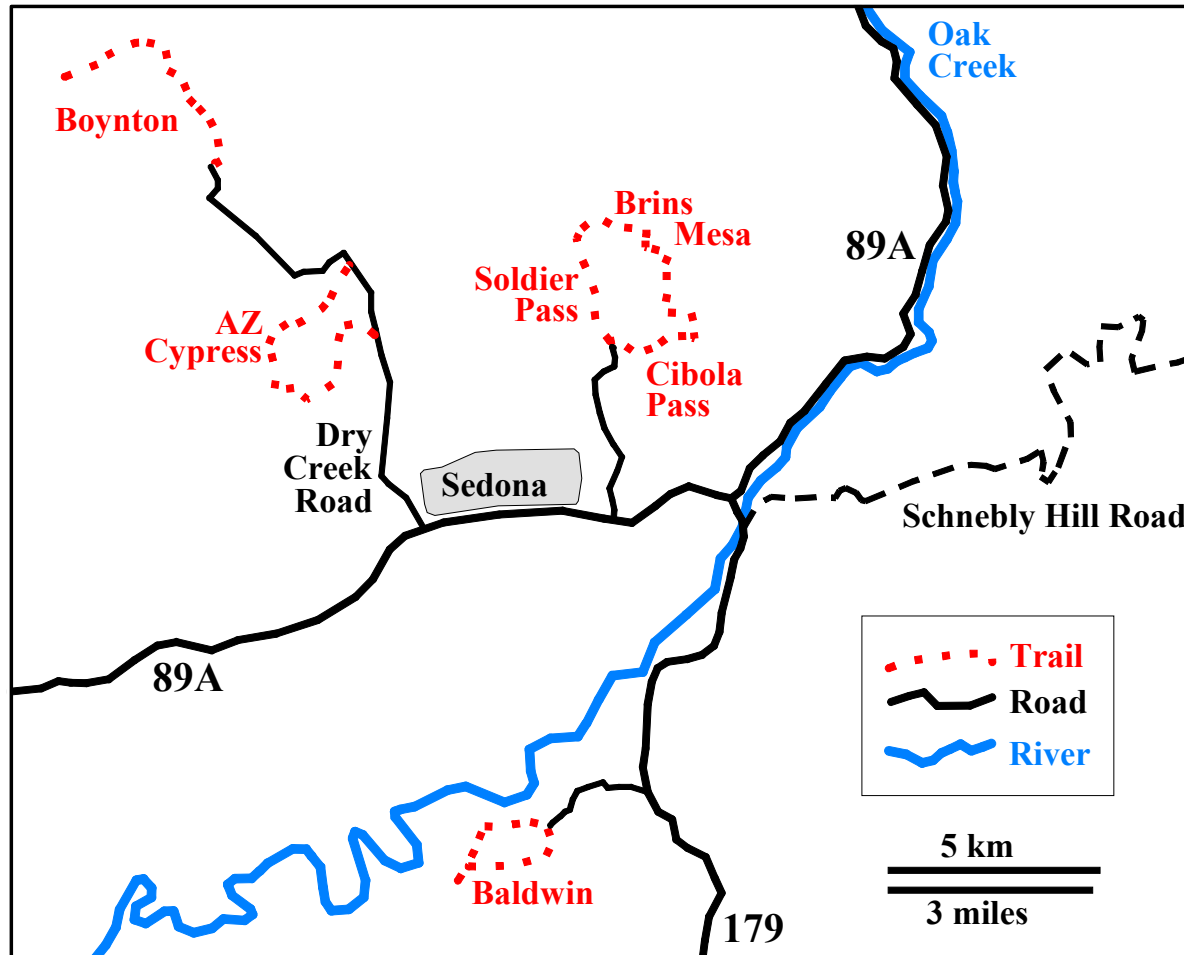




Fig. 1 : Arizona Cypress Trail : Arizona Cypress (*Cupressus glabra*) on the trail with mountain in background.

Fig. 2 : Arizona Cypress Trail : rough-bark form of *Cupressus glabra* with alligator texture.



Fig. 3 : Arizona Cypress Trail : flaky bark of *Cupressus glabra*.





Fig. 4 : Arizona Cypress Trail : semi-peeling smooth red bark form – *Cupressus glabra*.



Fig. 5 : Arizona Cypress Trail : shreddy bark form – *Cupressus glabra*.

Fig. 6 : Arizona Cypress Trail : close-up of foliage. Note that cones are not serotinous.





Fig. 7 : Soldier Pass Trail : multi-color smooth bark form of *C. glabra*.

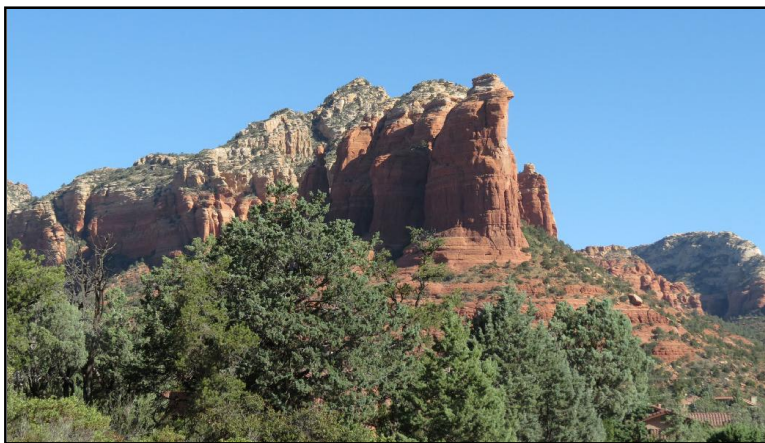


Fig. 8 : Arizona Cypress at the start of the Soldier Pass Trail.



Fig. 9 : Arizona Cypress at middle of Soldier Pass Trail.

Fig. 10 : Boynton Trail : Arizona Cypress in lower right hand corner.





Fig. 11 : Boynton Trail : rough flaky bark form of *Cupressus glabra*.

Fig. 12 : Boynton Trail : foliage and cones. Note some of the cones are not serotinous.





Fig. 13 : Baldwin Trail : note smooth red and green bark.



Fig. 14 : Dry Creek at US Hwy. 89A :
C. glabra – overall tree form.

Fig. 15 : Dry Creek at US Hwy. 89A : bark – semi-peeling smooth red bark form of *Cupressus glabra*.





Fig. 15 : Dry Creek at US Hwy. 89A : foliage – note glaucous blue-green color.



Fig. 16 : Soldier Pass to Brins Mesa to Cibola Pass Trails : yellowish-gray bark exfoliating in flakes.

Fig. 17 : Soldier Pass to Brins Mesa to Cibola Pass Trails : scenery.





Fig. 1 : Row of trees, road side, northern exposure.



Fig. 2 : Same row, southern exposure.

Fig. 3 : One row of trees the other side of the road was already cut.



Figures 4 to 24 : Bark variability of *Cupressus glabra*.







Cupressus glabra Sudworth 1910
ARIZONA SMOOTH CYPRESS

Along Schnebly Hill Road, Sedona, Coconino County, Arizona, USA.

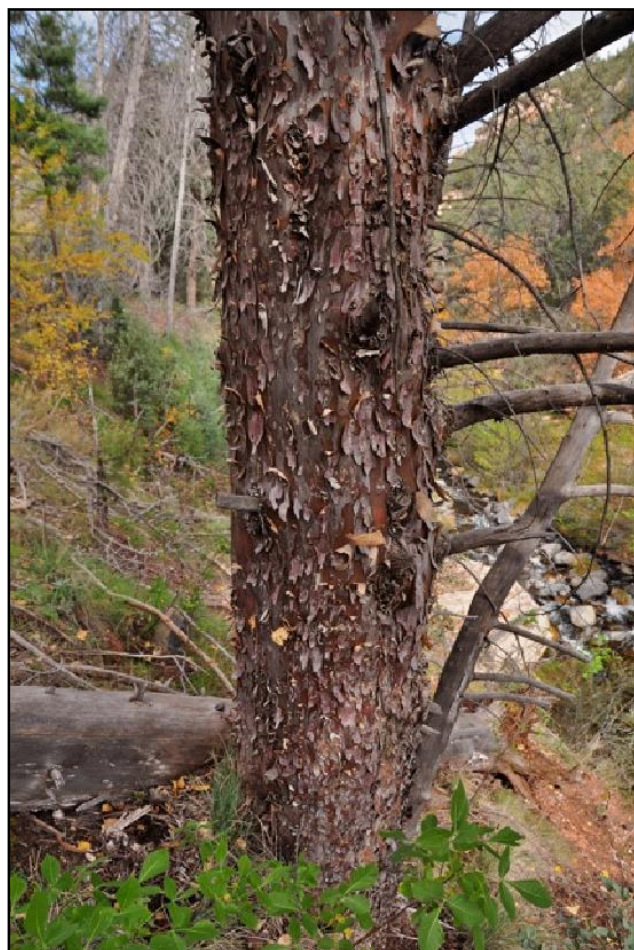


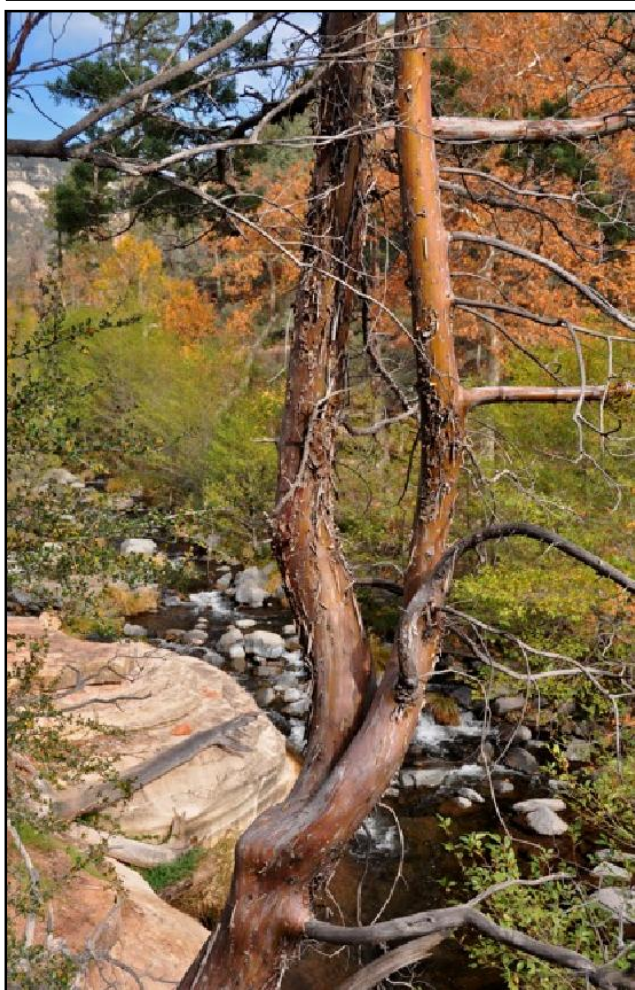


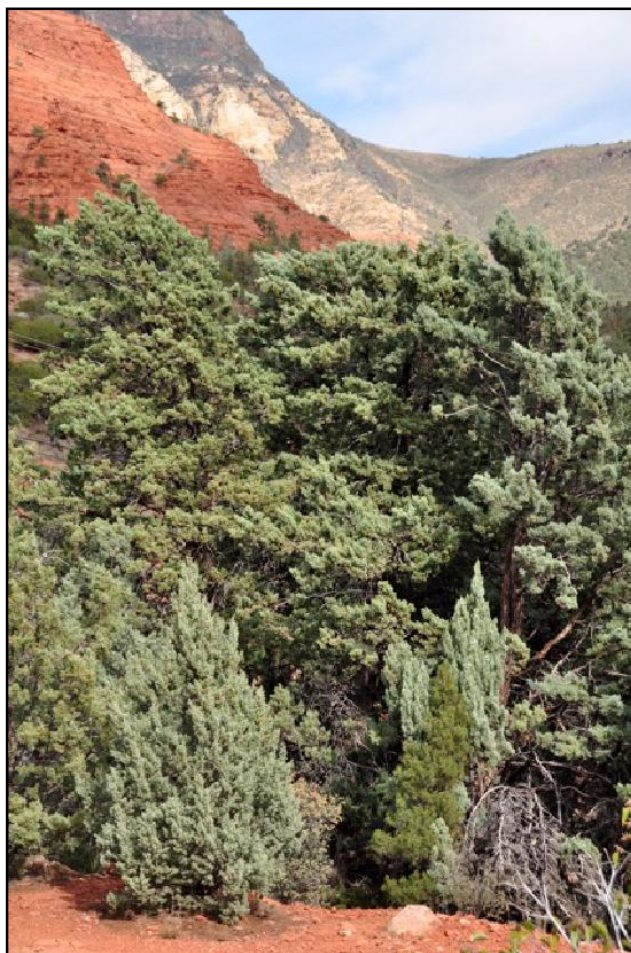
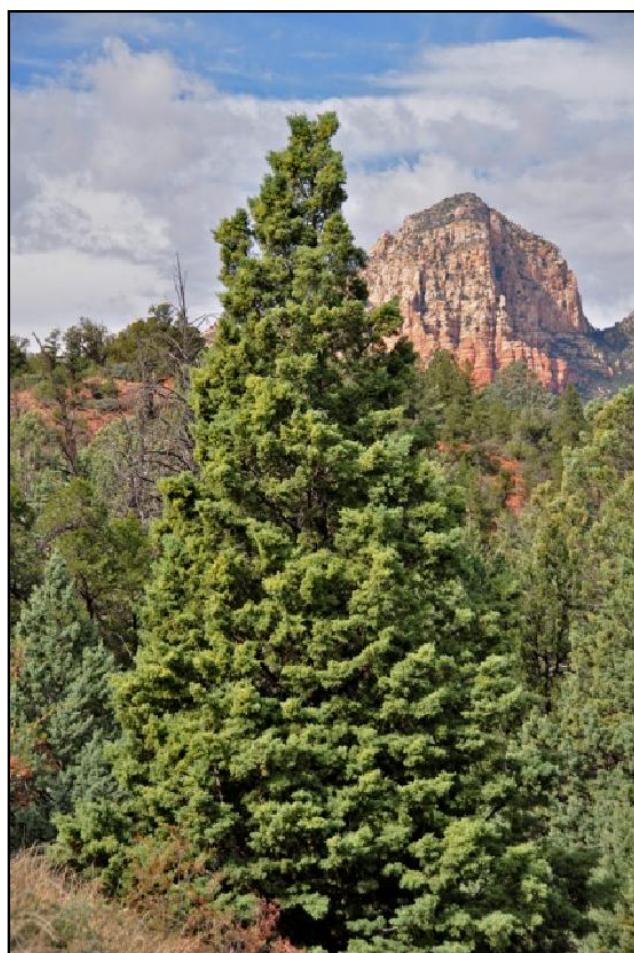
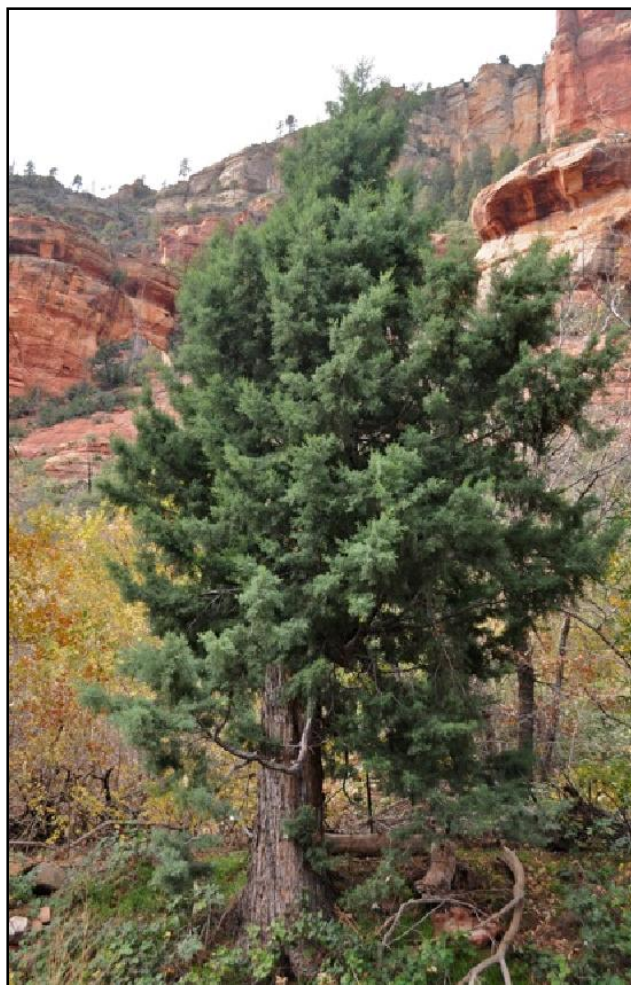
Cupressus glabra Sudworth 1910
ARIZONA SMOOTH CYPRESS

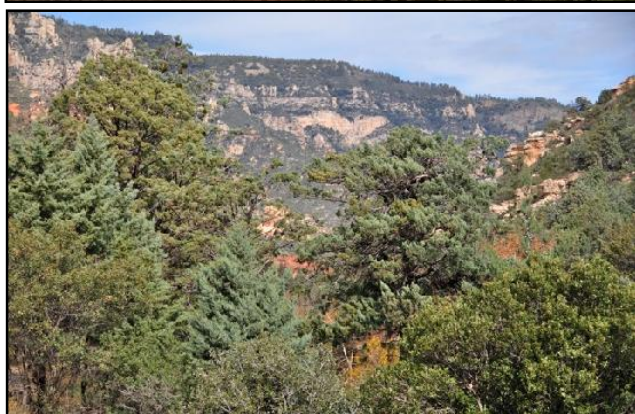
Oak Creek Canyon, Sedona, Yavapai County, Arizona, USA.











Typification of *Cupressus tortulosa* Griff.

In his proposal to reject the name *Cupressus tortulosa* Griff., Farjon (2010) affirms that the type of this name is not designated (“Typus: non designatus.”). He analyses the different attempts and concludes that none of the previous propositions is valid. Reviewing the presented arguments, the conclusion is far from obvious. The opportunity is taken to add some comments to this proposal (#1920).

Beginning with a review of the tentative typifications this and related names by Farjon :

Farjon 1994 :

- *Cupressus pendula* Griff., Itin. Pl. Khasyah Mts.: 131 (1848), non Thunb. (1783). Type: Bhutan, Rontung (‘prope pagodam supra Roongdong alt. 6400 ft.’), *Griffith* 529 (not located).

As mentioned by Farjon in his proposal, the name is illegitimate (priority rule), and the typification is also invalid (herbarium not mentioned and there is no way to attribute one existing unnumbered sheet to this collection rather than to another). Thunberg’s *Flora Japonica* publication date is August 1784 and not 1783. The modern name of Roongdong is Rongthoong or Rongthang.

- *Cupressus torulosis* Griff., Not. Pl. Asiat. 4: 26 (1854) [‘tortulosis’] & Ic. Pl. Asiat. 4, t.372 (1854), non D. Don [torulosa] (1824). Type: Bhutan, Dewangiri, *Griffith* 27 (K!).

The name is illegitimate, as *C. torulosis* is a later homonym of *C. torulosa* D. Don. Griffith’s entry name – that is the designated one – is “*Cupressus tortulosus*” and never ‘tortulosis’. Moreover the type of the replacement name shall be the same as the replaced one (ICBN 7.4¹).

Farjon 2005 :

- *Cupressus pendula* Griff., Itin. Pl. Khasyah Mts.: 131. 1848, non Thunb. (1784). Type: Bhutan. Punakha District: Dewangiri, [“prope pagodam supra Roongdong”], *W. Griffith* 27 (holotype K).

Here again Farjon is right : the name is illegitimate and the typification is invalid (according to ICN² article 7.10 : *hic designatus* is missing). The locality however, is not correct ; Roongdong is not close to Dewangiri (now Deothang) and is *Griffith* 529, not *Griffith* 27. Dewangiri is not in the Punakha District, but in the Samdrup Jongkhar District. As there are several syntypes, and none was designated as the holotype by Griffith, it remains the only possibility to lectotypify one of the syntypes.

- *Cupressus torulosis* Griff., Not. Pl. Asiat. 4: 26. 1854, non D. Don (1824). "tortulosus" Type: Illustration in *W. Griffith*, Icon. Pl. Asiat. 4, t. 372 (1854). (holotype).

Again the name is illegitimate (see above). The typification is invalid according to both ICN articles 7.4 (type of the replaced name typifies the new name) and 7.10 (*hic designatus* is missing). The illustration of plate 372 is posterior to the publication of *Cupressus pendula* and can no more be applied to that name.

Farjon is right to conclude that he did not typify *Cupressus pendula* Griff., nor *Cupressus tortulosa* Griff.

Silba 2009 :

Cupressus tortulosa Griffith, Not. Pl. Asiat. 4: 26 (1854a.)

Lectotype propositus- Griffith 27, from Dewangiri, Bhutan (lectotype-K).

Farjon (2010) comments on Silba’s lectotypification :

Can we consider the one acceptable type designation made for the later homotypic *C. tortulosa* to nonetheless be backwards transferable to the earlier *C. pendula* ? Automatic typification in a forward direction exists under Art. 7, but while it may be the practice of some to treat the reverse as such, the

¹ See Appendix 2 for the cited articles.

² International Code of Nomenclature for algae, fungi, and plants (Melbourne Code), 2011. Before: ICBN.

ICBN does not specifically address whether typification of a later name applies to an earlier basionym/replaced synonym.

It is worth noting at this point that :

- Silba chose for the lectotype of *Cupressus tortulosa* one of the syntypes of both *Cupressus pendula* and *tortulosa* ;
- if the Code of Nomenclature does not rule this case, it means that such practice is not illegitimate ;
- should the Code of Nomenclature later care to fix a rule about such cases, it cannot be applied backwards.

In this case the typifying author did not even recognise the two names as homotypic, so it seems impossible to backwardly transfer a lectotypification here.

This argument does not stand unless there is a type designated for *Cupressus pendula*. Which is not the case despite the affirmation by Silba³. There are only syntypes, and Griffith 27 is one of the syntypes for both *Cupressus pendula* and *Cupressus tortulosa*.

Likewise, Silba (in J. Int. Conifer Preserv. Soc. 16 (1, rev. ed.): 48. 2009) in indicating Griffith 27 at K as “Lectotype propositus” of *C. tortulosa*, if we can accept this phraseology as satisfying Art. 7.11, may also have failed to lectotypify this name, since he too did not recognise its homotypy with *C. pendula*, for which he indicated (but did not formally designate) a different type.

It is not clear if the words “Lectotypus propositus” instead of “hic designatus” are an equivalent to the later, although Farjon seems to acknowledge it. Proposing something is not exactly designating it. It is true on the other hand that the terms “lectotypus propositus” are of common usage. See for instance Franco 1968-69 designating the lectotype of *Cupressus torulosa* D.Don among three syntypes.

The article 7.4 of the Code of Nomenclature mentions the “type” (singular) being transferred from the illegitimate name to the replacement name (homotypy). It is our understanding that the interpretation of this rule remains open when there is no holotype, and no lectotype, but only syntypes. In fact the rule is mute about the fate of the syntypes and the paratypes in case of a replacement. In the *pendula-tortulosa* case, Griffith himself not only corrected the illegitimate name, but also did not designate exactly the same syntypes. Silba rightfully chose one of the syntypes of both species as the lectotype of *Cupressus tortulosa*.

Here are the available data.

The syntypes of *Cupressus pendula* are the specimens mentioned in the *Itinerary Notes* (Griffith 1848)⁴ :

- Griffith 27, p. 100 : 6 January 1838, “Dewangiri near the Faqueers house.” ; available at K under K000088093 ;
- Griffith 529, p. 131 : 31 January 1838, “Prope pagodam supra Roongdong alt. 6400 ft.”⁵ ; this specimen is not located/referenced as such in a herbarium ;
- Griffith 679a, p. 143 : 20 February 1838, locality not mentioned⁶ ; this specimen is not located/referenced as such in a herbarium ;

³ Silba 2009 : Griffith (1848) described the plant as *Cupressus pendula* Griffith based on Griffith n°529. [...] Since Griffith n°529 was earlier quoted as the type (holotype) for *C. pendula* Griffith, [...] In *Itinerary Notes* there is more than one description : see under #27 p.100 and #679a p. 143, and all these descriptions must be considered as part of the protologue with the same date of publication. It can be agreed with Farjon on this point. See also following note.

⁴ It is important to remember that the *Itinerary Notes* are what they claim to be, notes collected during Griffith’s journeys and published after he was deceased ; we can only speculate what was his intention about the sequence of the dates for the publication of his works and we must work with what we have now.

It is worth mentioning that Griffith’s *Journal of Travels* (1847) lists several additional localities other than just the four collections referenced in the *Itinerary Notes*.

⁵ But 7000 feet according to the *Journal of Travels* (Griffith 1847) : Then we came to a pretty temple built like a house, with a fine specimen of Cypress pendula, altitude of the place 7,000 feet. From this a fine view of Roondong is obtained.

- *Griffith 696*, p. 145, 25 February 1838, “Temple near Oongar, alt. 6000 ft.” ; this specimen is not located/referenced as such in a herbarium.

The syntypes of *Cupressus tortulosa* [*tortulosus*] are the specimens specifically mentioned in the *Notulae Ad Plantas Asiaticas* (Griffith 1854)⁷ :

- *Plate 372*, illustration, *Icones Plantarum Asiaticarum*, vol. 4, 1854 (see fig. 3) ;
- *Griffith 27*, p. 100 : 6 January 1838, “Dewangiri near the Faqueers house.” ; available at K under K000088093 ;
- *Griffith 529*, p. 131 : *Abies brunoniana*, 31 January 1838, “Above the pagoda above Bailfa alt 8300 ft.” ; this specimen is not located/referenced as such in a herbarium ;
- *Griffith 529*, p. 131 : *Cupressus pendula*, 31 January 1838, “Prope pagodam supra Roongdong alt. 6400 ft.” ; this specimen is not located/referenced as such in a herbarium.

Collections 679a and 696 are not mentioned.

On the other hand, to our knowledge, the the following currently available material are deposited in herbaria :

- *Griffith 27*, K, K000088093, see fig. 1 ;
- *Griffith s.n.*, K, K000075088, see fig. 4 ;
- *Griffith 1001/1*, Paris Herbarium, P06489919, see fig. 2;

It looks like K000075088 is a duplicate of *Griffith 27*.

As discussed above, the question remains open as to know whether it is possible to designate a lectotype for the replacement name when the replaced name does not have a holotype, nor a lectotype, but only syntypes. To avoid any further confusion or contestation, and for the sake of clarity, a formally acceptable lectotype for both Griffith's *Cupressus* names is proposed and designated below, confirming – if necessary – the lectotypification done by Silba.

Among all syntypes, only *Griffith 27* satisfies the different articles of the ICN, that is :

- to be available and referenced in a herbarium ;
- the type of the replaced name becomes the type of the replacement name (homotypy) ;
- the type is mentioned as one of the syntypes of both names.

Therefore :

***Cupressus pendula* Griff.**, 1848, *Itinerary Notes*, 2: 131. Illegitimate name : *Cupressus pendula* Thunberg (*Flora Japonica*, 1784: 265-266) has priority.

Syntypes :

- *Griffith 27*, *Itinerary Notes*, 100, Dewangiri, Samdrup Jongkhar District, Bhutan ;
- *Griffith 529*, *Itinerary Notes*, 131, Roongdong, Trashigang District, Bhutan ;
- *Griffith 679a*, *Itinerary Notes*, 143, locality not mentioned, Bhutan ;
- *Griffith 696*, *Itinerary Notes*, 145, Oongar, Lhuntse District, Bhutan.

Lectotypus (hic designatus) : *Griffith 27*, 6 January 1838, Dewangiri (now Deothang), Samdrup Jongkhar District, Bhutan (K – K000088093).

***Cupressus tortulosa* Griff.**, *Notulae Ad Plantas Asiaticas*, 1854, 4: 26.

As a replacement name for *Cupressus pendula* Griff.

= *Cupressus pendula* Griff.

Syntypes :

- *Plate 372*, *Icones Plantarum Asiaticarum* ;
- *Griffith 27*, *Itinerary Notes*, 100, Dewangiri, Samdrup Jongkhar District, Bhutan ;
- *Griffith 529*, *Abies brunoniana*,⁸ *Itinerary Notes*, 131, Balfai, Trashigang District, Bhutan ;

⁶ From the specimens collected under #679 as well as before and after #679, the locality is situated in the Kuru Chhu valley (then “Kooree”) in Bhutan.

⁷ Unless all the syntypes are transferred automatically and/or the new types mentioned with the replacement name are discarded.

- Griffith 529, *Cupressus pendula*, *Itinerary Notes*, 131 Roongdong, Trashigang District, Bhutan ;

Lectotypus hic designatus : Griffith 27, 6 January 1838, Dewangiri (now Deothang), Samdrup Jongkhar District, Bhutan (K – K000088093). See fig. 1.

Epitypus hic designatus : Griffith 1001/1, (MNH Herbarium – P06489919). This specimen, contrary to the Kew ones, has mature cones which will help to fix the species. See fig. 2.

Although concluding that there was so far no valid typification of *Cupressus tortulosa*, Farjon (2010) did not provide one.

Finally two more arguments from Farjon are worth commenting :

- 1) In the protologue there appear two different spellings: “*Cupressus tortulosus*” in the main entry on p. 26 and the Index on p. 750, and “*Cupressus torulosis*” in the caption of plate CCCLXXII (372) of the separate but simultaneously published *Icones plantarum asiaticarum*.

The index of *Icones Plantarum Asiaticarum* has *tortulosus*. It appears that the caption is just one of the numerous typographic mistakes present in Griffith’s works when he could not review them before publication. The errata at the end of the *Itinerary Notes* are 4 pages long and are not exhaustive⁹. To note that the reference to the plate in the index is also not correct, 456 instead of 372.

- 2) Although some other names have also been applied to it, the name *Cupressus cashmeriana* Royle ex Carrière has in recent decades become well established to denote the Weeping Cypress of Bhutan.

It is necessary to stress again that the Bhutanese themselves never use the name *Cupressus cashmeriana*, but systematically *Cupressus corneyana* Carrière for their national tree. They claim that *Cupressus cashmeriana* is a different taxon of Indian origin. This is in agreement with the recent investigations on the species grown in Europe, which were first studied and diagnosed by French author Élie-Abel Carrière in the 19th century (Maerki 2013).

Bibliography

- Farjon, A. (1994). 253. *Cupressus cashmeriana*, Cupressaceae. *The Kew Magazine* 11 (4): 156-166.
- Farjon, A. (1998). *World Checklist and Bibliography of Conifers*. Kew, England.
- Farjon, A. (2001). *World Checklist and Bibliography of Conifers*. 2nd ed. Kew, England.
- Farjon, A. (2005). *A Monograph of Cupressaceae and of Sciadopitys*. Kew Publishing, Richmond, Surrey, UK.
- Farjon, A. (2010). (1920) Proposal to reject the name *Cupressus tortulosa* (Cupressaceae). *Taxon* 59 (1): 297.
- Franco, J.D.A. (1968-1969). On Himalayan-Chinese Cypresses. *Portugaliae Acta Biologica Ser.B*, 9 (3-4): 183-195.
- Griffith, W. (1847). *Journals of Travels In Assam, Burma, Bootan, Affghanistan and the Neighbouring Countries*. Posthumous Papers Bequeathed to the Honorable, the East India Company and Printed by Order of the Government of Bengal. Arranged by John McClelland. Bishop’s College Press, Calcutta, India Orientali.
- Griffith, W. (1848). *Itinerary Notes of Plants Collected in the Khasyah and Bootan Mountains, 1837-38, in Affghanisthan and Neighbouring Countries. 1839 to 1841*. Posthumous Papers Bequeathed to the Honourable, the East India Company and Printed by Order of the Government of Bengal. Vol. II Arranged by John McClelland. J.F. Bellamy, Calcutta, India Orientali.
- Griffith, W. (1854). *Notulae ad Plantas Asiaticas*. Part IV. *Dicotyledonous Plants*. Posthumous Papers Bequeathed to the Honourable, the East India Company, and Printed by Order of the Government of Bengal. Arranged by John McClelland. C.A. Serrao, Calcutta, India Orientali.
- Griffith, W. (1854a). *Icones Plantarum Asiaticarum*. Part IV, *Dicotyledonous Plants*. Coshan, Calcutta, India Orientali.
- Maerki, D. (2013). Which Latin Name for the Tsenden? *Bull. CCP* 2 (2): 39-71.
- Silba, J. (2009). The Taxonomy of the Griffith Cypress (*Cupressus tortulosa* Griffith). *J. Int. Conifer Preserv. Soc.* 16 (1) with add.: 45-50.
- Thunberg, C.P. (1784). *Flora Japonica, sistens plantas insularum japonicarum*. I.G.Müller, Leipzig, Germany.

⁸ *Abies brunoniana* is a synonym of *Tsuga dumosa*, but the specimen here is listed by Griffith as a synonym of *Cupressus tortulosa*.

⁹ The indulgence of the reader is craved for the numerous typographical errors with which the foregoing work abounds. Although many of these are included in the following list, yet still to be complete, it would have extended too far, without any adequate advantage, since the repetitions of the trivial misprints are so obvious, that the reader will have no difficulty in correcting them, wherever they occur. Griffith 1848, lxx (after 436).



Fig. 1.

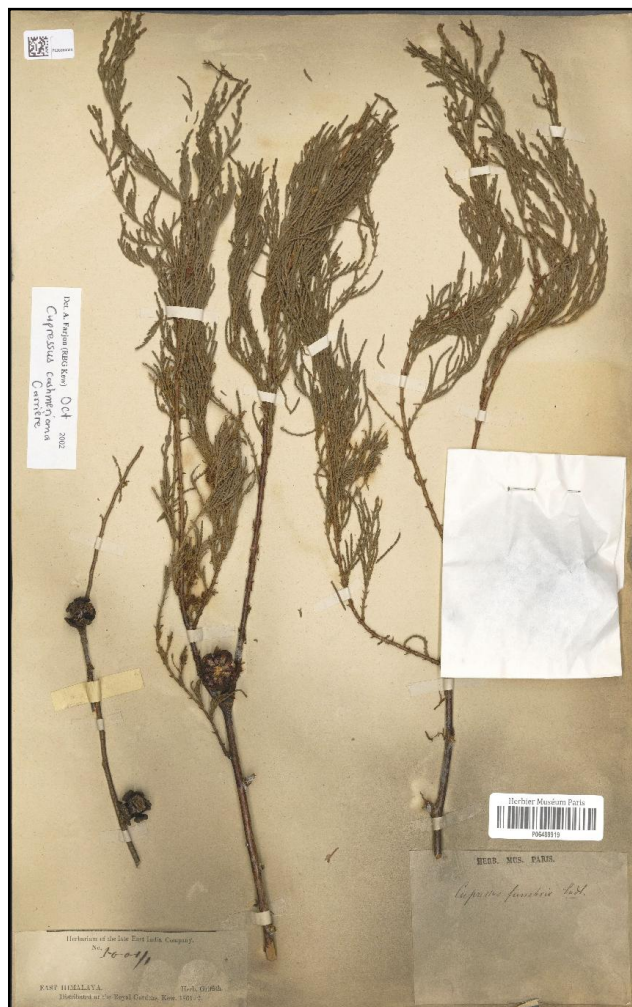


Fig. 2.

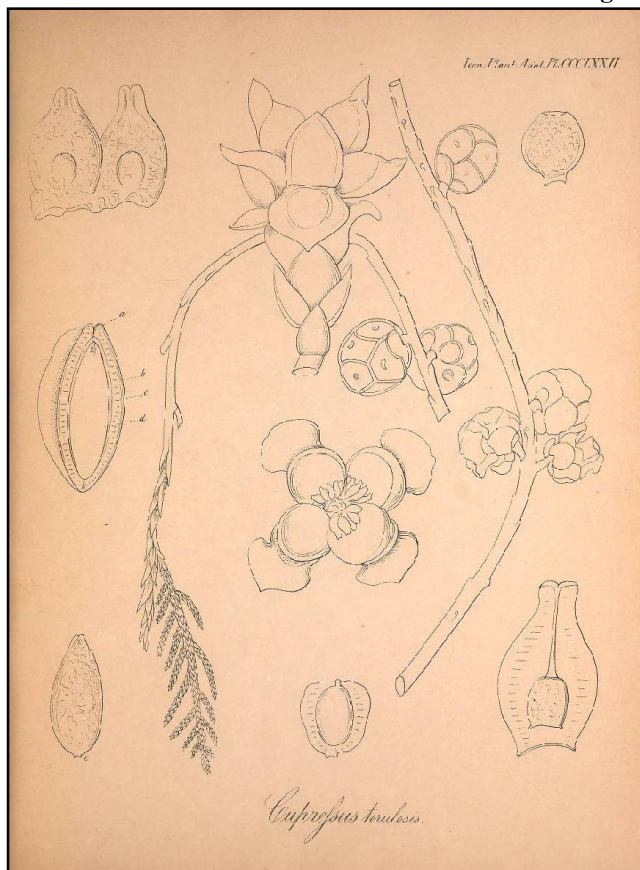


Fig. 3.



Fig. 4.

Fig. 1 : Griffith 27 ; *Cupressus tortulosa*, lectotypus hic designatus. © Kew herbarium, Royal Botanic Gardens, UK. (K)¹⁰. K000088093.

Fig. 2 : Griffith 1001/1 ; *Cupressus tortulosa*, epitypus hic designatus. © Herbar MNHN, Paris, France. Collection : Plantes vasculaires (P). P06489919.

Fig. 3 : Plate 372. *Cupressus tortulosa*, ["torulosis"]. Griffith 1854a.

Fig. 4 : Griffith s.n. ; *Cupressus tortulosa*. This specimen appears to be a double of Griffith 27. © Kew herbarium, Royal Botanic Gardens, UK. (K)¹⁰. K000075088.

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Appendix 1 : Griffith's protologues of *Cupressus pendula* and *Cupressus tortulosa*.

Griffith 1848: 100

27. Juniperi sp. Ic. It. Boot t. 36 vide no. 529 — Arbor parva elegantissima cortici loevi. Ramulis pendulis foliis senioribus ferrugineo brunneis junioribus glaucis. Dewangiri near the Faqueers house.

27. Juniperi sp. Ic. It. Boot t. 36 vide no. 529—Arbor parva elegantissima cortici loevi. Ramulis pendulis foliis senioribus ferrugineo brunneis junioribus glaucis. Dewangiri near the Faqueers house.

Griffith 1848: 131

529. Abies Brunoniana, arbor magna solitaria taxiformis, trunco demissa ramoso. Ramis longis ramulis pendulis foliis distichis patentissimis, sub falcatis linearibus, subtus glaucis, gemmis masculis axillarib pisiformibus.

529. Abies Brunoniana, arbor magna solitaria taxiformis, trunco demissa ramoso. Ramis longis ramulis pendulis foliis distichis patentissimis, sub falcatis linearibus, subtus glaucis, gemmis masculis axillarib pisiformibus.

Above the pagoda above Bailfa alt 8300 ft.

Above the pagoda above Bailfa alt 8300 ft.

— Cupressus pendula, vide num 27 arbor magna formossima, trunco loevi. Rami et praesertim ramuli penduli, apices versus tantum foliosi, foliis arct imbricatis squamiformibus quadrifariis ob approximatione ramulis ultimis obtusis apice cupuliformibus, obsolete 4 gonis.

— Cupressus pendula, vide num 27 arbor magna formossima, trunco loevi. Rami et praesertim ramuli penduli, apices versus tantum foliosi, foliis arct imbricatis squamiformibus quadrifariis ob approximatione ramulis ultimis obtusis apice cupuliformibus, obsolete 4 gonis.

Strobilis sub globosis sub sessilibus in partibus ramulorum denudatis, squamis basilaribus subreniformibus, apicalibus quadratis, reliquis lato sub pentagonis seminibus castaneis oblongis ambitu irregularibus vix alatis.

Prope pagodam supra Roongdong alt. 6400 ft. It is a sacred tree.

Strobilis sub globosis sub sessilibus in partibus ramulorum denudatis, squamis basilaribus subreniformibus, apicalibus quadratis, reliquis lato sub pentagonis seminibus castaneis oblongis ambitu irregularibus vix alatis.

Prope pagodara supra Roongdong alt. 6400 ft. It is a sacred tree.

Griffith 1848: 143

679a. Cupressus pendula. Arbor saepe 80 pedalis elegantissima dioica? Strobilis foemineis esquamis (bracteis) oppositis, paria, quaternata, sub verticillatis approximatione in sinu foveitibus ovula plura biseriata. Tegument unicum apice forato, nucleus parvus, conis sub rotundis squamis induratis simiplura alat marginata pars ossea e testae parti interiora ossefacto. Nucleus liber cellulosus apice sphacelatus. Albumen continius Embryo nucusque nullus.

679a. Cupressus pendula. Arbor saepe 80 pedalis elegantissima dioica? Strobilis foemineis esquamis (bracteis) oppositis, paria, quaternata, sub verticillatis approximatione in sinu foveitibus ovula plura biseriata. Tegument unicum apice forato, nucleus parvus, conis sub rotundis squamis induratis simiplura alat marginata pars ossea e testae parti interiora ossefacto. Nucleus liber cellulosus apice sphacelatus. Albumen continius Embryo nucusque nullus.

Griffith 1848: 145

696. Juniperi sp. Icon. It. Boot. t. 62 mas. 63 fem.—Arbuscula (cortici uti solet in cupressimis loevissima.) with a scraggy appearance 20 ft. high ramulis soepius pendentibus foliis linear-lanceolatis acutis, Galbulis ovatis.

696. Juniperi sp. Icon. It. Boot. t. 62 mas. 63 fem.—Arbuscula (cortici uti solet in cupressimis loevissima.) with a scraggy appearance 20 ft. high ramulis soepius pendentibus foliis linear-lanceolatis acutis, Galbulis ovatis.

Temple near Oongar with C. pendula alt. 6000 ft.

Temple near Oongar with C. pendula alt. 6000 ft.

Griffith 1854: 26

CUPRESSUS.

1. *Cupressus tortulosus* Pl. CCCLXXII. Cupressus pendula, Abies Brunoniana Gr. Itinerary Notes pp. 100, 131 Nos. 27 and 529.

a. micropyle, b wing, c ossified testa, e nucleus.

CUPRESSUS.

1. *Cupressus tortulosus* Pl. CCCLXXII. Cupressus pendula, Abies Brunoniana Gr. Itinerary Notes pp. 100, 131 Nos. 27 and 529.

a. micropyle, b wing, c ossified testa, e nucleus.

Griffith 1854: 376-377

The scales of the female fruit of *Cupressus pendula* are analogous to the membranous scales of *Pinus*, hence they are not carpellary leaves, but bractese. This species is remarkable for the indefinite number of its ovula.

which are arranged irregularly, and in two series in the axil of each scale : these again are opposite, and decussate, becoming by approximation quaternarily subverticillate. The ovula as in *Pinus*, consist of one tegument perforate at its apex, and enclosing a nucleus of ordinary form, they are erect, while in that genus they are inverted, pointing to, and not from the axis. It is this genus, so far at least as appears to me, that approximates to *Gnetum*, for supposing the scales to be completely connivent, we shall have the inflorescence of *Gnetum*, with this exception, that it is diclinous. See *Ephedra*. This genus proves other interesting facts, first that bractes are more permanent in some cases than carpellary leaves, secondly that female flowers may literally consist of nothing but an ovule, as in *Gnetum*, thus strengthening Mr. Brown's view. It would be needless to assert that the scales of this genus are carpellary leaves, because the ovula have no manner connection with them. I should not be surprised, were ample materials found to exist, at the separation of *Cupressinae* into a distinct family. This is pointed out by the habit, the nature and opposition of the leaves, and the structure of the flowers. They are of a lower degree of organisation than true *Conifereae*.

Griffith 1854: 750 (Index)

Cupressus tortulosus 26

Griffith 1854a: Pl. 372 (see fig. 3, page 73)

Cupressus torulosis

Griffith 1854a: iii (Index)

Cupressus tortulosus (Plate) 456 (Notulae page) 26

Appendix 2 : Cited articles of the International Code of Nomenclature for algae, fungi, and plants (Melbourne Code), Melbourne, Australia, July 2011.

6.11. A replacement name (avowed substitute, *nomen novum*, *nom. nov.*) is a new name based on a legitimate or illegitimate, previously published name, which is its replaced synonym. The replaced synonym, when legitimate, does not provide the final epithet, name, or stem of the replacement name (see also Art. [58.1](#)).

7.4. (Vienna 7.3) A replacement name (Art. [6.11](#)) is typified by the type of the replaced synonym even though it may have been applied erroneously to a taxon now considered not to include that type (but see Art. [41 Note 3](#) and [48.1](#)).

7.10. (Vienna 7.11) For purposes of priority (Art. [9.19](#), [9.20](#), and [10.5](#)), designation of a type is achieved only if the type is definitely accepted as such by the typifying author, if the type element is clearly indicated by direct citation including the term “type” (*typus*) or an equivalent, and, on or after 1 January 2001, if the typification statement includes the phrase “designated here” (*hic designatus*) or an equivalent.

9.23. (Vienna 9.21) On or after 1 January 2001, lectotypification or neotypification of a name of a species or infraspecific taxon is not effected unless indicated by use of the term “lectotypus” or “neotypus”, its abbreviation, or its equivalent in a modern language (see also Art. [7.10](#) and [9.9](#)).

58.1. If there is no obstacle under the rules, the final epithet in an illegitimate name may be re-used in a different name, at either the same or a different rank; or an illegitimate generic name may be re-used as the epithet in the name of a subdivision of a genus. The resulting name is then treated either as a replacement name with the same type as the illegitimate name (Art. [7.4](#); see also Art. [7.5](#) and Art. [41 Note 3](#)) or as the name of a new taxon with a different type. Its priority does not date back to the publication of the illegitimate name (see Art. [11.3–11.4](#)).

*Cupressus guadalupensis***Un arbre plus que centenaire**

Planté vraisemblablement à la fin du 19^{ème} siècle, longtemps pris pour un *Cupressus glabra*, un magnifique *Cupressus guadalupensis* déploie ses branches dans un parc créé en 1892 dans le sud de la France. Sa cime (mesurée au télémètre laser le 7 août 2013) atteint entre 24.2 et 25 mètres à partir du sol. La circonférence du tronc à 1.70 m de hauteur est de 383 cm, soit plus d'un mètre de diamètre. Sous réserve d'un vieux spécimen cultivé en Californie (voir page suivante), il est fort possible que cet arbre soit le plus vieux Cyprès de Guadalupe vivant, que ce soit dans son aire naturelle ou en culture. Cette espèce unique a été décrite par Watson en 1879. Comme arbre remarquable, ce spécimen mérite protection.

Le jardin "Impératrice Eugénie", anciennement connu sous le nom de "parc des Miniatures" (aujourd'hui géré par la direction de l'éducation de la Ville de Nice, était à l'origine un parc créé par le Dr. Axel Robertson-Proschowsky (1857-1944) en 1892, et s'appelait alors "Parc des Tropiques". Ce monsieur, médecin et naturaliste





était à l'époque un des grands spécialistes mondiaux des palmiers (125 espèces cultivées, sur 2000 ou 3000 espèces en tout). Ce parc botanique, haut lieu de l'acclimatation à l'époque est resté en activité une cinquantaine d'années.

On peut également noter, que c'est en visitant ce parc étant enfant, émerveillé, que Julien Marnier-Lapostolle, fondateur de la Villa "Les Cèdres" en tant que jardin botanique gagna le goût pour les végétaux exotiques.

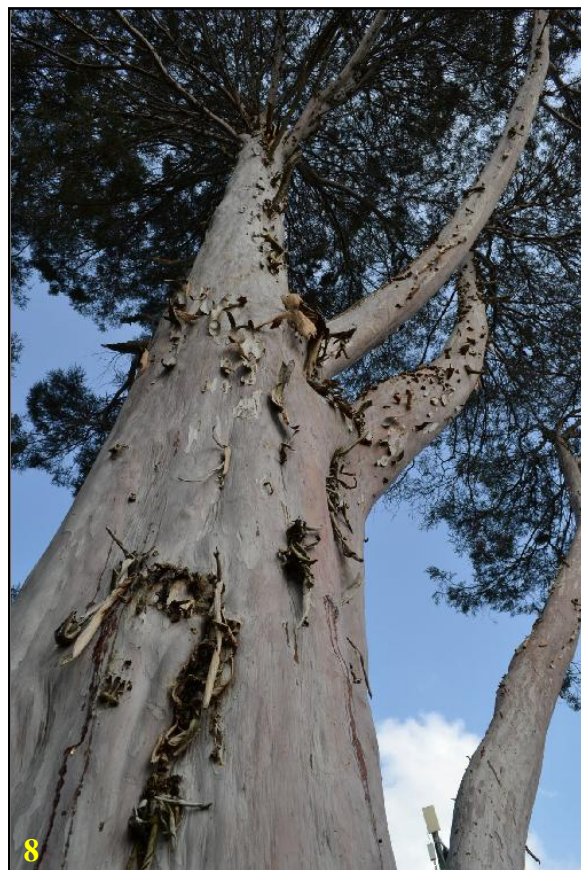
Il y a plusieurs *Cupressus guadalupensis* au Roeding Park à Fresno en Californie. Les dimensions du plus grand spécimen sont les suivantes : hauteur : 21.3 m [70 feet], diamètre : 523 cm [206 inches], largeur de la couronne : 14.6 m [48 feet]. Les plantations au Roeding Park ont commencé en 1904 en vue de constituer un arboretum avec de nombreuses espèces d'arbres récoltées autour du monde. Ces arbres semblent avoir été greffés (Joey Malone, pers. comm.).

Crédit photos : figures 1 à 4, page 76 : France, CCP.

Figures 5 à 8, page 77 : Fresno, Californie, Joey Malone.

Sources : <http://www.saverroedingpark.org/>

<http://californiabigtrees.calpoly.edu/images.lasso?KeyValue=37>



Cupressus atlantica, a critically endangered species

Trip report

Moroccan Cypress, *أطلسي سرو* (Azeli) in vernacular language, is a cypress species¹ endemic to Morocco and described only in 1950 by the French botanist Henri Gaussen under the Latin name *Cupressus atlantica*. It was known since 1921, but had not been distinguished from the Mediterranean Cypress *Cupressus sempervirens* L. It differs from the latter by a series of morphological and phenological characters and by its isolation in several valleys of the Moroccan High Atlas to the west of Mount Toubkal, the highest summit of this mountain range. The most important populations are located in the valley of the Oued N-Fis and in a certain number of valleys of its tributaries. Other populations with a smaller number of individuals are to be found even more isolated on other slopes, mainly in a western direction. The observed altitude of these populations varies between 1,100 and 2,000 m.

The following observations were made on 29 April and 2–3 May 2014.

Which are the threats bearing on this species still present with several thousands of specimens? First of all, the absence of meaningful regeneration due to over-grazing. The domestic herds, mainly goats, hinder any regeneration by excessive grazing throughout the species' distribution range (see fig. 17)². A second threat, just as worrying, is the plantation of exotic cypresses with the hybridisation risks which such an introduction creates. These plantations have increased recently as we could observe it in several places (*Cupressus sempervirens*, see fig. 9, 26, 34, 35 and 38). Other Mediterranean cypresses already adult are present, mainly close to villages. Between these two species of afro-mediterranean cypresses, hybridisations – although not yet described – are more than likely and could become important once the planted *Cupressus sempervirens* reach their maturity.

Two immature cones a little more than one year old were collected on a young cypress. This sapling was growing near the foot of an adult *Cupressus atlantica*. These cones showed characteristics which are not usually found on *C. atlantica*; the cones were not only elongated, but showed concave scales instead of convex ones. One cone was still green, the other had partially conserved its green colour, when on *C. atlantica* the green colour had already completely disappeared (see fig. 23, 25, 41 and 43 for comparison). Whether this sapling was a hybrid with *Cupressus sempervirens*, or extreme variability inside *C. atlantica*, remains to be determined.

One important plantation³ of *Cupressus glabra* Sudworth, already with fully mature trees, partially protected by a fence, dominates the Oued N'Fis valley between 2,070 and 2,140 m altitude (see fig. 39 and 40). It is situated close to the Tizi-N'Test pass (2,098 m.). The pollen of these trees can be blown largely in the lower valley of the oued N'Fis and reach several *Cupressus atlantica* populations. Hybridisation cannot be excluded. Lower germination rates could also be expected. A small group of this new world species is also planted close to Mouldidirt.

Many young seed cones of the current year were visible. At higher altitudes, the cones were smaller, with a uniformly green colour (see fig. 25). The cones of the previous year (2013), still immature and closed, were found only on very few trees. One tree showed an abundant cone production (see fig. 23), while a couple of others were bearing only very few such cones (see fig. 27). Two year old cones (pollinated in 2012) were in great quantities and all were open, with seeds already released (see fig. 24). No older cones were present on the trees. This is an important difference with *Cupressus sempervirens*. The cones of that species are strongly serotinous and can remain on the trees closed (or rarely open) for several years, while all *C. atlantica* cones are opening at maturity and fall during the following year.

The few young plants observed were on the side of the roads. Obviously these places are less heavily frequented by goat herds.

Several populations of *Cupressus atlantica* were isolated close to villages. Their size and shape suggests that they have been cultivated for a long time as wood supply for building and fuelwood, and as

¹ The IUCN considers this taxon as a subspecies of *Cupressus dupreziana* A.Camus, the Sahara Cypress. As the two species cannot hybridise (a specific barrier is established), there is no reason to adopt such taxonomic treatment. Moreover when the IUCN lists both the Moroccan Cypress and the Sahara Cypress as critically endangered (CR), it classifies the "species" only as endangered (EN).

² This fact has been known for many years and is constantly mentioned in articles dealing with *Cupressus atlantica*.

³ The estimated surface area of this plantation reaches almost 8 hectares.

fodder for domestic animals. Pruning can be light or heavy, eventually killing the tree (see fig. 28, 29 and 36). They are often pruned so as to form multi-stemmed trees (see fig. 9 and 32). In the immediate vicinity of Rikt (also Rakte; altitude 1,150 m.), many *Cupressus sempervirens* have been planted recently among much older *Cupressus atlantica* and an irrigation system has been dug on the slope to insure the growth of the seedlings, allowing them to overcome the summer droughts (see fig. 34 and 35).

TL collected three samples for the Muséum national d'Histoire naturelle (P) (see fig. 2, 4 & 6).

The other conifers observed together with the cypresses in the Oued N'Fis valley are *Tetraclinis articulata* Mast. (at the lower altitudes, but usually on separate slopes), *Juniperus phoenicea* L. (often seen as a companion species of *Tetraclinis articulata* or *Cupressus atlantica*) and *Juniperus oxycedrus* L. (at the higher altitudes).

Above 2,000 m, the main tree species along the Tizi-N'Test road is *Quercus rotundifolia* Lam.

Suggestions and recommendations

It is always difficult and sensitive to propose an advice from an external – or even foreign in this case – point of view. Nevertheless we think in all fairness that these suggestions are aimed first of all at protecting an exceptional, unique heritage. The genes of a population cannot be created from new again.

The first measure, which has some cost, would be to eradicate as soon as possible all *Cupressus sempervirens* growing in these valleys and to replace them systematically by the native species. In a next stage, the same process should be undertaken with the *Cupressus glabra*. To implement such policy, the creation of nurseries in the Oued N'Fis valley, growing seedlings of *Cupressus atlantica* of known origins, could present a valuable economic investment.

Further, we would strongly recommend the installation of a zone of exclusion from herbivore animals, for instance on a minimal surface of one hectare inside the most important population of *Cupressus atlantica*, such as the one at Aghbar. The installation of fenced areas (as already exists around part of the *Cupressus glabra* planted grove) will allow the conduct of scientific observations over several years. The experience of Guadalupe Island (in the Pacific Ocean off Baja California, Mexico) where goats were eradicated from the island is more than encouraging. As soon as the goats were completely removed, regeneration was incredibly abundant for the cypresses (*Cupressus guadalupensis* Watson) as well as for the pines (*Pinus radiata* D. Don var. *binata* (Engelm.) Lemmon). Several thousands of seedlings established themselves in the next few years.

If this project will be put to test, the place of this protected area should be selected with great care. To make sure for instance that the enclosed cypresses are producing cones abundantly with viable seeds, and on ground not completely deprived of soil.

Selected bibliography of recent articles

- Bechir A., El Mousadik A. & Pichot C. (2004). Diversité allozymique de peuplements de cyprès naturels et introduits au Maroc : conséquences pour la gestion des ressources. *Annals of Forest Science* 61: 669-676.
- Hafidi M., Ouahmane L., Thioulouse J., Sanguin H., Boumezzough A., Prin Y., Baudoin E., Galiana A. & Duponnois R. (2013). Managing Mediterranean nurse plants-mediated effects on soil microbial functions to improve rock phosphate solubilisation processes and early growth of *Cupressus atlantica* Gaussen. *Ecological Engineering* 57: 57-64.
- Ouahmane L., Duponnois R., Hafidi M., Kisa M., Boumezzough A., Thioulouse J. & Plenchette C. (2006). Some Mediterranean plant species (*Lavandula* spp. and *Thymus satureioides*) act as potential 'plant nurses' for the early growth of *Cupressus atlantica*. *Plant Ecology* 185:123-134.
- Ouahmane, L., Hafidi M., Thioulouse J., Ducousso M., Kisa M., Prin Y., Galiana A., Boumezzough A. & Duponnois R. (2007). Improvement of *Cupressus atlantica* Gaussen growth by inoculation with native arbuscular mycorrhizal fungi. *Journal of Applied Microbiology* 103 (3): 683-690.
- Sękiewicz K., Sękiewicz M., Romo A., Didukh Y., Fennane M. & Boratyński A. (2014). Chorological and conservation status of the endemic cypress, *Cupressus atlantica* Gaussen, in the High Atlas (Morocco). *Dendrobiology* 71: 3-13.
- Sfairi Y., Laatik I., Abbad A. & Ouahmane L. (2014). Etude de la variabilité morphométrique et de la production en grains des peuplements semenciers du cyprès de l'Atlas. 5^{ème} Colloque International sur le Genévrier Thurifère, Marrakech, Maroc.
- Sfairi Y., Ouahmane L. & Abbad A. (2012). Breaking seed dormancy in *Cupressus atlantica* Gaussen, an endemic and threatened coniferous tree in Morocco. *Journal of Forestry Research* 23 (3): 385-390.
- Zarik L., Boumezzough A., Hafidi M., Ouhammou A., Fuponnois R. & Ouahmane L. (2014). Réponse des plantules du cyprès de l'Atlas (*Cupressus atlantica* G.) à un stress hydrique en présence d'un complexe de champignons mycorhiziens. 5^{ème} Colloque International sur le Genévrier Thurifère, Marrakech, Maroc.



Fig. 1: One of the tallest trees, ca. 20 m.



Fig. 2: The first sample was taken from this tree.

Fig. 3: Massive trunk of the tree on the extreme right side of the photo in fig. 2. This monumental tree was pruned several times and looks like sculpted. A core sample was taken from its trunk and it revealed an age of 700 years (M.Alifriqui, personal communication). TL poses to give the scale.





Fig. 4: Second sample for the National Museum of Natural History (MNHN, Paris [P]) taken from this tree.

Fig. 6: Third sample.



Fig. 5: Note the different foliage (see fig. 20).

Fig. 7: Typical conical crown.





Fig. 8: Pruned *Cupressus atlantica* showing the formation of several “poles” parallel to the trunk.

Fig. 9: Plantation of *Cupressus sempervirens*. Above the slope, a natural population of *C. atlantica*.





Fig. 10: Isolated grove. It is likely that these trees not far from the road and some houses were planted.

Fig. 11: Aghbar forest on a west slope: first trees from the road descending from the Tizi-N'Test.





Fig. 12 & 13: Aghbar forest: wide open space between the trees.

Fig. 14: Aghbar forest: note the rocky slope with almost no soil.





Fig. 15: Aghbar forest: tree with grey bark.

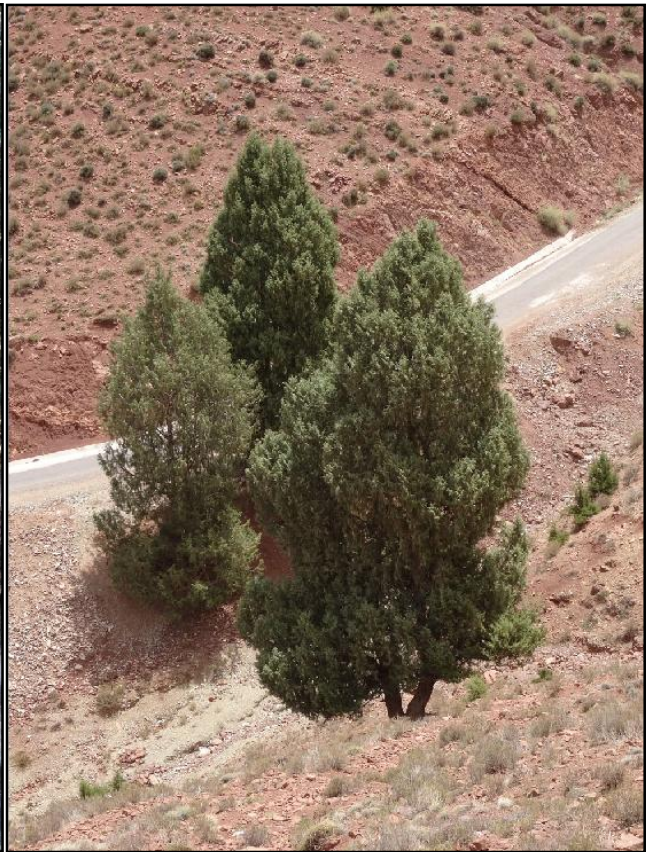


Fig. 15: Between Amarzgane and Tassila.

Fig. 17: One goat among the cypresses of the Aghbar population. It is one of the many animals grazing at this place.



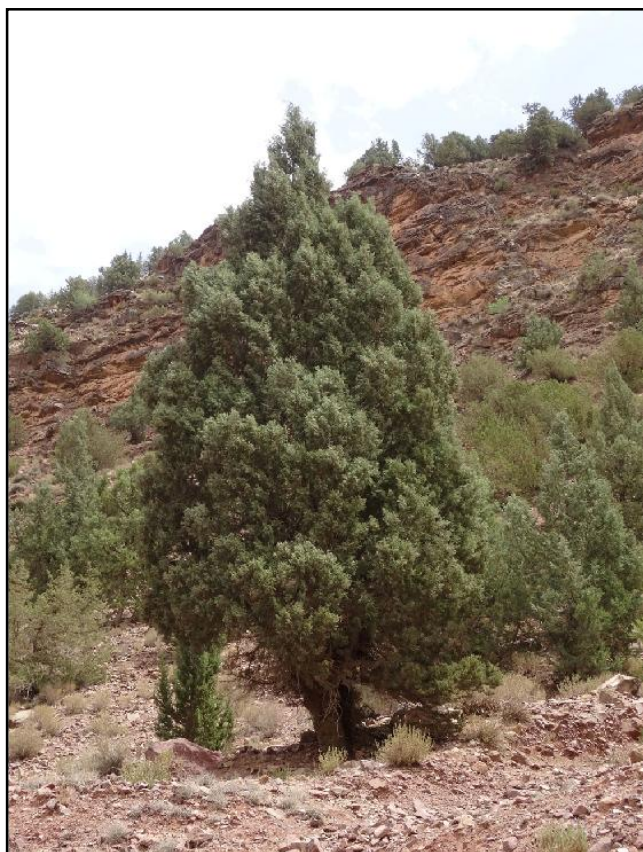


Fig. 18: Beautiful specimen with a full crown.

Fig. 19: Sapling growing close to the road.

Fig. 20: Glaucous pendulous foliage appears on old mature trees, while lower branches still display a greener colour with straight shoots.





Fig. 21: Slopes covered with mature *Cupressus atlantica*.

Fig. 22: Young seedlings growing on the side of the road below a couple of mature trees.





Fig. 23: Several one year old immature seed cones still closed; they have already changed colour from green to light brown (pollinated in 2013).

Fig. 26: Seed cone of *C. sempervirens* cultivated at Rikt (see fig. 30 & 31).



Fig. 24: Two years old cones already open, but still attached to the shoot (pollinated in 2012); the seeds have been released. Note the empty pollen cones, still hanging (2014).

Fig. 25: Green cones pollinated this year (2014); this tree was at one of the lowest altitude: 1,100 m.; seed cones at a higher altitude were still smaller.



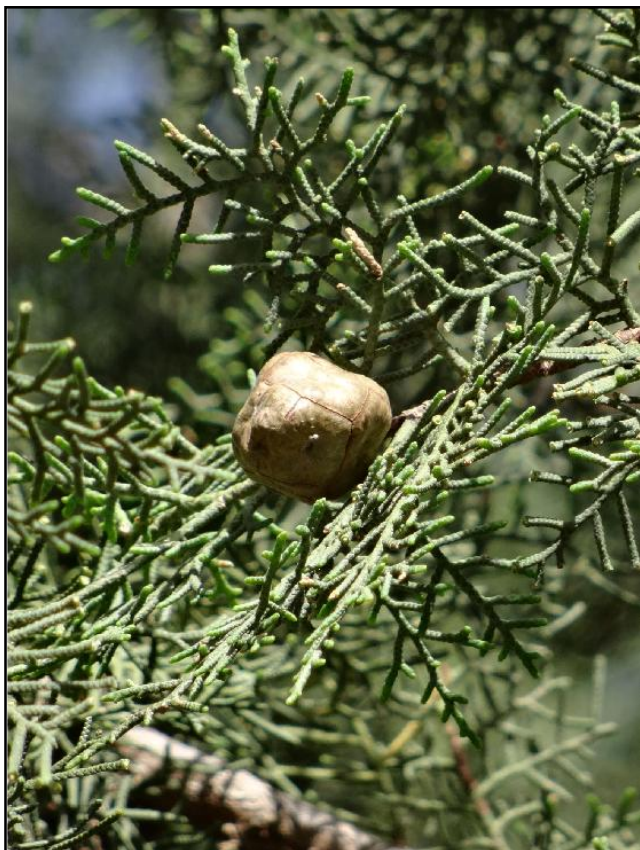


Fig. 27: Isolated 2013 cone.

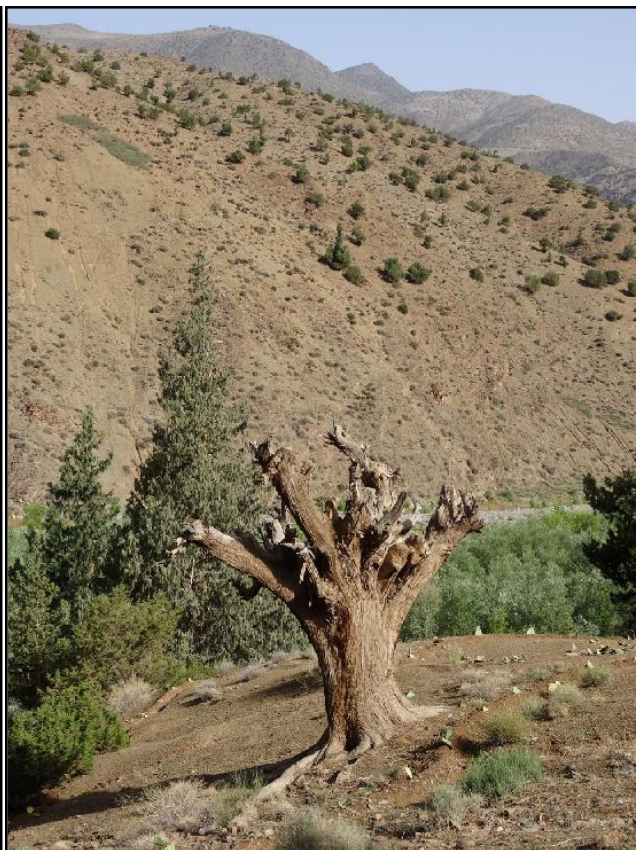


Fig. 28: Rikt: pruned tree beyond survival.

Fig. 29: Rikt: few secondary branches have been cut.



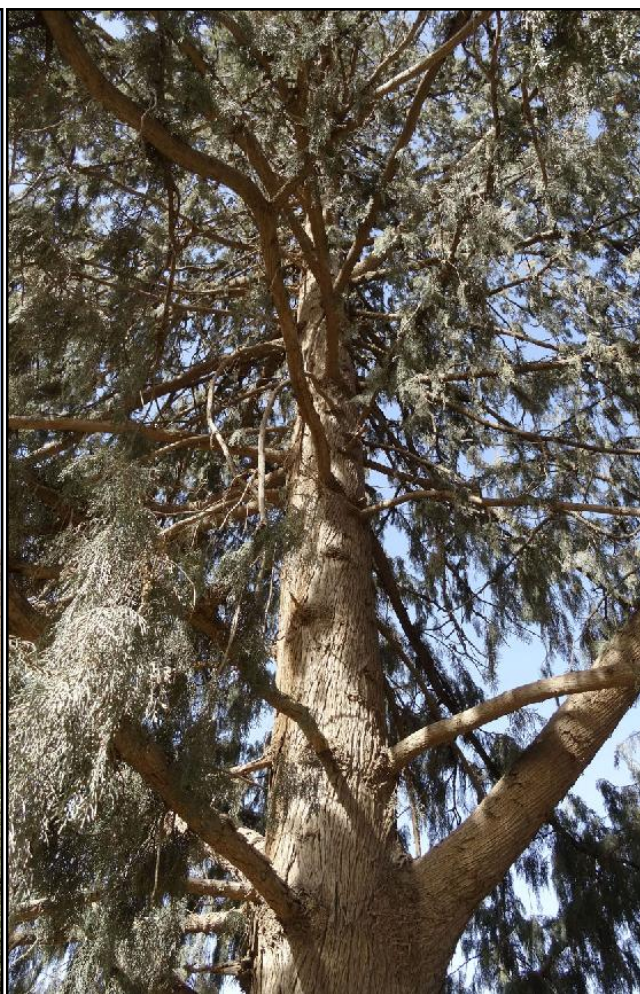


Fig. 30, 31 & 32: Rikt grove outside the village: two mature specimens; trees here have all a light brown bark with either parallel or intertwined stripes.



Fig. 33: Light brown bark.



Fig. 34: Cultivated seedling of *Cupressus sempervirens* already producing seed cones (see fig. 26).

Fig. 35: Inside the *Cupressus atlantica* grove and shaded by the mature trees, cultivated seedlings of *Cupressus sempervirens*. Note the irrigation system marked with *Opuntia* pads.





Fig. 36: Conical crowns of varying density.



Fig. 37: Rikt: the lower crown was exploited for branches.

Fig. 38: Another plantation of *C. sempervirens* on the left side of the oued N'Fis, after Ouirgane.

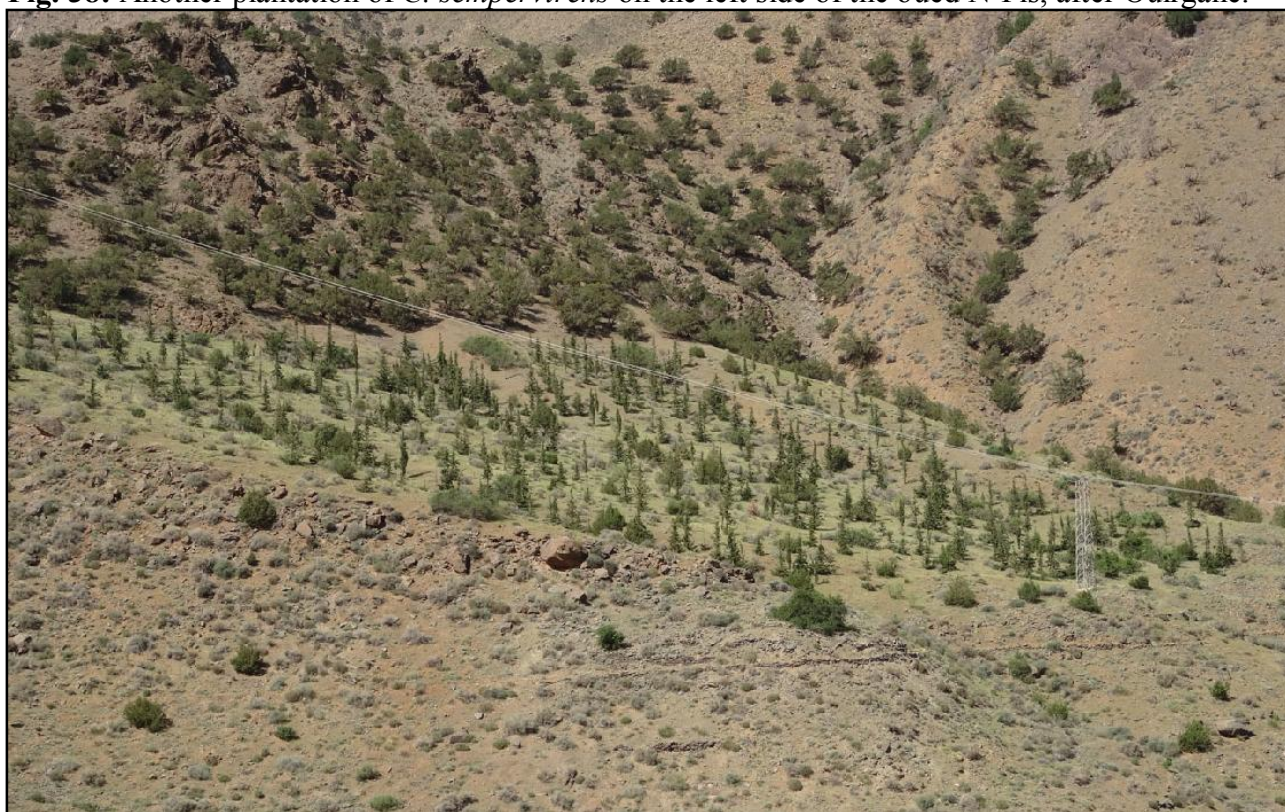




Fig. 39: Plantation of *Cupressus glabra* along the Tizi-N'Test road at 2100 m. altitude.

Fig. 40: These mature trees are producing lots of pollen and seed cones.



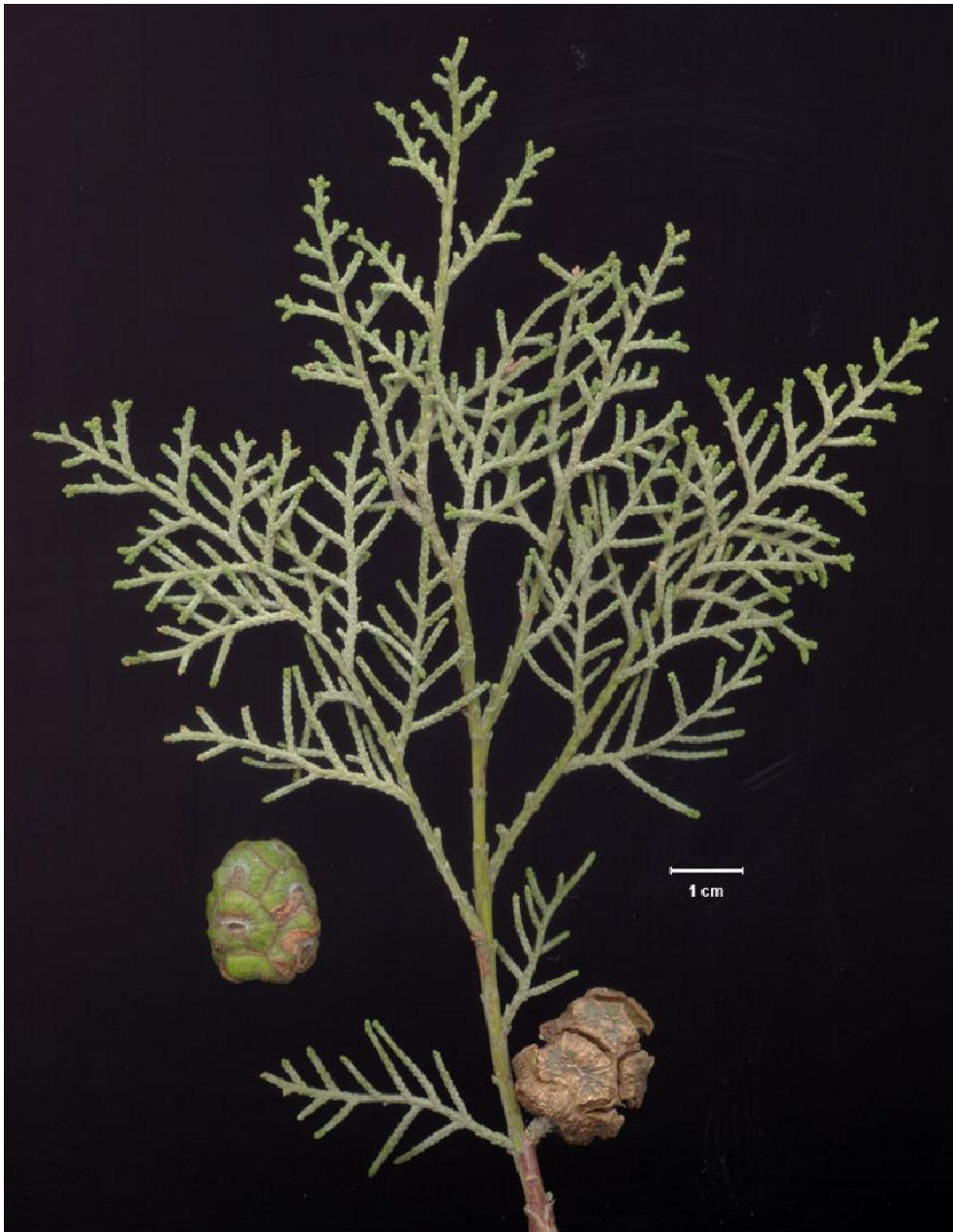


Fig. 41: Very strange cones, looking intermediate between *Cupressus atlantica* and *Cupressus sempervirens* or just extreme variability inside *Cupressus atlantica*.



Fig. 42: Sample of one year old cones.



Fig. 43: One year old cones with foliage.

Fig. 44: Two years old cones after seed release.





Fig. 45: Beautiful tree with light brown bark, an irregular crown and a glaucous pendulous foliage.

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