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Herausgeber: Dr. Michael Lorek, Grillparzer Weg 35a, D-42289 Wuppertal, info@tropengarten.de
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Inhaltsverzeichnis

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Inventory, threatened status and taxonomy of *Trachycarpus takil* in Uttarakhand, India

M. Lorek

Abstract: An assessment of natural and cultivated stands of the Indian species Trachycarpus takil in Uttarakhand, India, revealed that T. takil is critically endangered. The populations are concentrated in three areas and the pressure of human activities is very high. Some populations are extinct or almost so. Trachycarpus takil is closely related to T. fortunei. - With 4 figures and 1 table.

Keywords: IUCN assessment - Trachycarpus takil - threatened status - Uttarakhand

Trachycarpus takil Becc. is an endemic Indian Arecaceae established by Beccari in 1905. Later (Beccari 1931) he mentioned four natural sites in western Himalaya, Uttarakhand, India: 1) Thalkedar south of Pithorargh, 2) Kalamuni in north-eastern Kumaon, 3) Badkot jungle north-west of Almora and 4) Satbunga mountain east of Nainital. Cultivated stands should be found in the botanical garden Chaubattia near Ranikhet (Beccari 1931, Kulkarni & Mulani 2004), Nainital (Garg & Husain 2004) and Munsyari (Singh et al. 1995).

Trachycarpus takil is listed in the Red Data Book of Indian Plants (Nayar & Sastry 1988). An inventory by Singh et al. (1995) mentioned three still existing occurrences: Badkot with "3-4 naturally growing, adult, flowering plants of this species, along with a few young seedlings"; Betulidhar "near Kalamuni pass (ca. 2700 m) with a number of young and adult trees"; and Thalkedar "in the vicinity of Bhilaunt village (ca. 2200 m), but no adult tree could be located". They stated that *T. takil* has to be regarded as an endangered species.

Nine years later, an inventory by Garg & Husain (2004) resulted in "four naturally multiplying big populations of this palm [at] Thalkedar, Girigaon, Kalamuni and Badkot forest". They stated that *Trachycarpus takil* is not endangered. On the other hand, the most recent estimation by Gibbons et al. (2008) stated that "three small, wild populations of this palm still exist in the temperate oak forest" but that "the Thalkedar population has only seedlings, the Girigaon/Kalamuni population has only ±5 adults plus some juveniles, and the

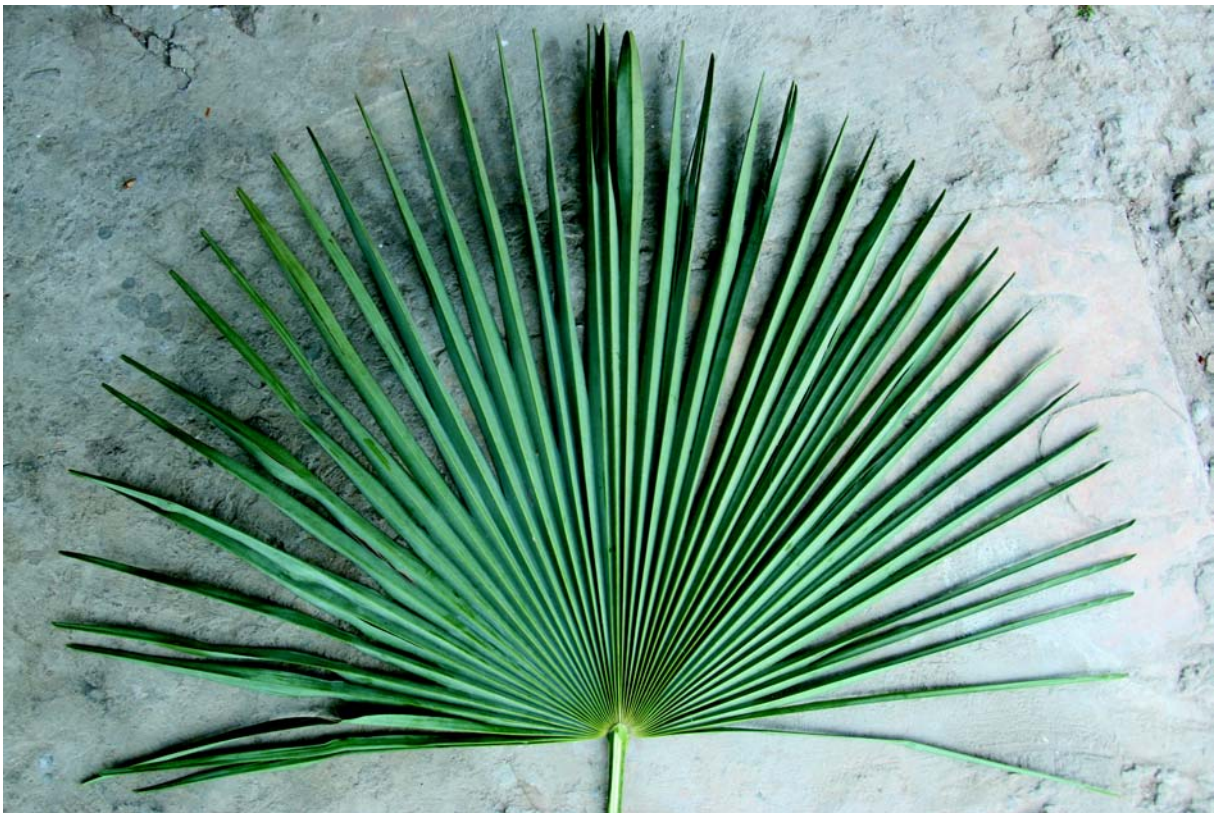

Figure 1 Lamina of a mature Trachycarpus takil at Kalamuni, photo of the glaucescent lower surface

population at Badkot has been reduced to almost nothing." As published before in a detailed inventory (Lorek 2008), the real status of *Trachycarpus takil* is far from the assessments of Garg & Husain (2004) or Gibbons et al. (2008). Most likely Singh et al. (1995) presented an inventory that best represents the reality.

The inventory by Lorek (2008) revealed an actual status as follows (figure 3): The population at Satbunga is regionally extinct, categorisation according to IUCN (2001): RE. The population at Badkot is reduced to five juvenile plants and a few seedlings, whereas the Thalkedar population encompasses countless seedlings and juvenile plants in the forest of the hills. Both must be regarded as critically endangered: CR A1b D. The metapopulation (Hanski & Gilpin 1991) around Kalamuni-pass comprises four populations: CR A4 B1bi C2aii.

Satbunga (cultivated): *T. fortunei*, 1 juvenile
Mukteshwar (cultivated): *T. fortunei*, 2 adults, and 1 juvenile
Catonment (cultivated): *T. fortunei*, 4 adults, 4 juvenile
Chaubattia (cultivated): *T. fortunei*, 9 adults, sub spontaneous population
Nainital (cultivated): *T. fortunei*, 6 adults, probably much more
Badkot (native): *T. takil*, 5 juvenile
Lavshal (cultivated): *T. takil*, 3 adults, and 1 juvenile
Kalamuni
Kalamuni-pass (native): *T. takil*, ca. 30 adults
Ratapani, 1+2 (native): *T. takil*, 52 adults
Birthi (native): *T. takil*, ca. 20 adults
Ginin-Bend (nat.): *T. takil*, 1 adult, 12 juveniles
Munsyari (cultivated): *T. takil*, 2 adults
Thalkedar (native): *T. takil*, countless juveniles
Barabey (cultivated): *T. takil*, 1 adult

Table 1 comprehensive list of cultivated and native stands of Trachycarpus species in Kumaon

Regarding the metapopulation in the vicinity of the village Ratapani (2190–2280 m, N 30° 02.126' E 80° 11.321'), one can find 52 adult palms and more than 100 juvenile ones below and above the village (Ratapani 1 + 2). This habitat most likely was mentioned by Gibbons et al. (2008) as "Girigaon/Kalamuni" with an estimate of "only ±5 adults". Despite the fact that is quite vague, they missed examining the total expansion of the vicinity. Kalamuni-pass (2533 m, N 30° 02.086' E 80° 12.19') itself has more than 30 adult and over 100 juvenile plants. It is located just behind the

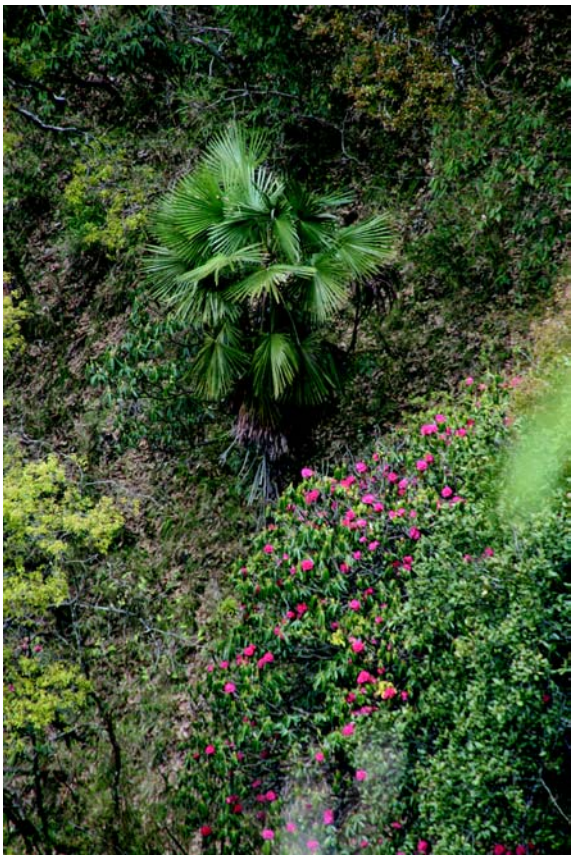

Figure 2 Mature Trachycarpus takil, approximately 10 m height, Kalamuni-pass

mountain-ridge, on the opposite side of Ratapani. There is also a third population at Birthi (1918 m, N 30° 01.953' E 80° 10.876') with approximately 20 adult plants growing in a steep ravine. A fourth population at Ginin-Bend (2012 m, N 30° 01.162' E 80° 10.571') is under much more pressure than the other populations of this meta-habitat; it encompasses many destroyed plants and only one adult *T. takil*.

Though the metapopulation at Kalamuni is still reproducing, the assessment given here has shown the threatened status of *Trachycarpus takil* as critically endangered. This categorisation is similar to the assessments given by most of other authors.

Trachycarpus takil is under very high pressure from human influence, i. e. being cut down for firewood and to use the leaves as brooms, or being grazed by cattle or goats (figure 4). Nevertheless, the metapopulation of Kalamuni could be a source of re-introduction of *T. takil* into the wild, according to ICUN guidelines. That is: seedlings were found in the Kalamuni metapopulation as well as significant numbers of adult plants (figures 2 and 4). Nevertheless, it is quite urgent to stop extraction of botanical materials, plants and seeds, from the

wild and to put the habitats and cultivated stands under strict control of government rather than in hands of profiteers. According to the IUCN guidelines for re-introduction of a species, none of the conservation terms, neither re-introduction, translocation, nor benign introduction are being applied to *T. takil*. The commercial trade totally ignores IUCN guidelines, too. Also the trials of reforestation by local forest departments are pointless as sources for re-introduction because they belong to *T. fortunei*, not *T. takil* (see below). If nothing in the contrary happens, *T. takil* will become extinct in the wild in India.

The taxonomy of *Trachycarpus fortunei* (Hook.) H. Wendl. and *T. takil* is regarded critically by many authors (Nayar & Sastry 1988; Rana et al. 1995; Jones 1995; Lorek 2006 and 2007). Therefore the inventory by Lorek (2008) contains the observation of all accessible sites with *Trachycarpi* in Uttarakhand, natural populations, synanthropic stands and anthropogenic plantings, because non-natural stands may be a source for re-introduction (table 1).

The results of the inventory of non-natural stands are as follows: Plants cultivated in Mukteshwar, Cantonment (Rhaniket), Chaubattia and Nainital are *Trachycarpus fortunei*. The adventitious population in the forest of Chaubattia belongs to that species, too.

The only possible sources of re-introduction are the metapopulation at Kalamuni or the cultivated stands in Barabay, Lavshal and Munsyari. The first stand in Barabay was mentioned by Rana et al. (1995) and was "planted by Mr. Hira Ballabh Joshi about 50 years ago". The latter stand in Munsyari also was published by Singh et al. (1995). Plants in Lavshal ("Kausani") are confirmed by DNA-analysis to be *T. takil* (J. G. Rohwer pers. comm.). Furthermore, Kholia (2009) mentioned four cultivated plants in Lamgarah, nearby Thalkedar; that place was not included in our inventory.

The taxonomic treatment of *Trachycarpus takil* encompasses some morphotypes as described earlier by Lorek (2006, 2008). The most constant characters of *T. takil* are the appendices in the apical portion of the trunk. The fibres are disintegrating into short and broad ligulae and do not split into individual fibres as on *T. fortunei*. Additionally, the inflorescence is often larger than on *T. fortunei*. There are no significant differences regarding the flowers. The open crown quoted as a distinguishing character by some authors, is not constant. In the metapopulation and cultivated stands plants are found with open and dense crowns (figure 2), based on local growing conditions, i.e. intensity of sunlight, amount of soil cover over the rocks, or humidity. The more or less regularly split segments are also an inconstant character because deeply divided laminas are sometimes found in *T. takil*. Some strains of *T. wagnerianus* Becc. and *T. fortunei* display also a cheirophyllous character as could be found in most *T. takil* (see Lorek 2008). The lamina of *T. takil* is more often divided evenly, but not generally (figure 1).

It is more likely that the morphotypes of *T. takil* represent an endemic phylogenetic adaption of a common anchestor to the local environment of Kumaon rather than it represents an intrinsic taxon on species level. The anchestor may be *T. fortunei*, in correct view of taxonomy. First, the number of constant distinct characters is very low, see above. And regarding the cultivated and natural plants, not all plants display broad appendices, i.e. the cultivated plants in Lavshal show fibres as in *T. fortunei*, albeit the specimens at Lavshal are confirmed to be *T. takil*. According to local people, the gathering site was in Badkhot jungle. Second, the overlapping characters found by the inventory of Beccaris garden are the equivalent of easy introgression of both species, *T. takil* and *T. fortunei*, planted and cultivated by Beccari since the late 19th century. DNA analysis of these specimens revealed no hybrids (J. G. Rohwer pers. comm.). This leads to the conclusion that plants of the lush F1 generation growing everywhere in Beccaris garden are representatives of free gene exchange and support

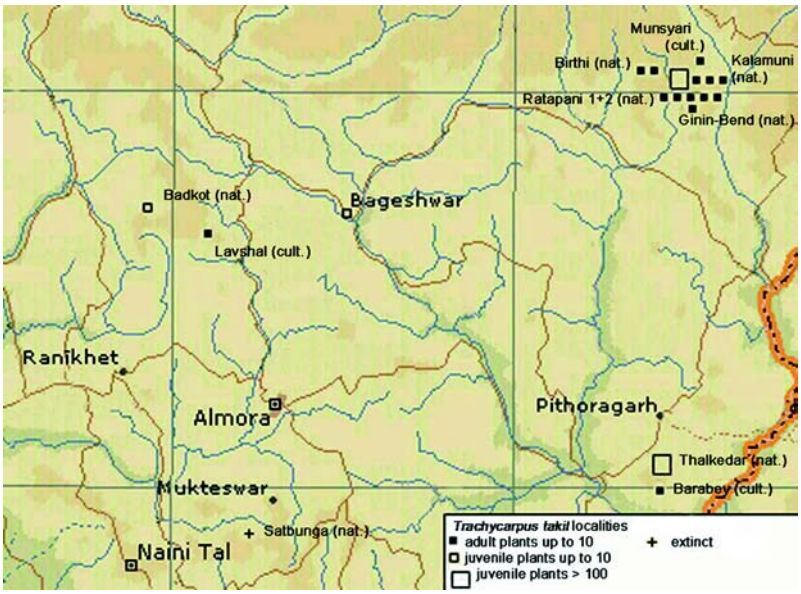

Figure 3 Map of cultivated and native stands of Trachycarpus takil in Kumaon

the very close relationship of both taxa.

Regarding the inflorescence, particularly the anthesis, this systematic view is supported by two different morphotypes of *T. takil* found in Kumaon. Plants in Lavshal and Barabey perform spadices sizes as in *T. fortunei*. They drop at the start of anthesis, whereas the plants in Kalamuni and Munsyari have rather more voluminous spadices with persisting spathae, still fixed on the flowering stalk, until the end of anthesis. Obviously these morphotypes represent a phenotypic adaption to local conditions. Most likely herein is found the explanation of different, inconsistent characters between the plants in Beccaris garden (*T. taki* s. str., though few plants display characters of "*T. fortunei*", see Lorek 2006) and the Indian stands.

Figure 4 Trachycarpus takil seedling with signs of grazing as frequently could be found at Kalamuni

It should also be mentioned that the plants in the metapopulation at Kalamuni pass and all other *T. takil* plants in Kumaon obviously differ from the description presented by Gibbons et al. (2008). None of the laminae showed "segments 50–65 in mature trees". The maximum count in all natural stands was 50 segments (figure 1 at Kalamuni-pass). Only one plant in Kumaon, the cultivated *T. takil* in Barabey, showed 58 segments. Kholia (pers. comm.) confirmed that the maximum count was taken on this plant. Additionally, it should be highlighted, that the type-locality is not Thalkedar in India, but Florence: "in my garden in Florence, the male plant, the description of which is given above" (Beccari 1931).

After all *Trachycarpus takil* represents an endemic Indian taxon, no mind whether it is regarded as a species of its own or a local infraspecific taxon of *T. fortunei*, adopted to the westernmost extension of the genus *Trachycarpus* in the Kumaon mountains. *Trachycarpus takil* is critically endangered and under very high pressure. As a severe impact also seed gatherers are commercially exploiting *T. takil* plants in Kumaon. Hopefully, these activities will be stopped immediately. The only good news are that cultivated plants of *T. takil* have been reported from Kumaon, i. e. by Kholia (2009) in Lamgarah, and the possibility that more natural populations may exist on the other side of the border in Nepal. It becomes obvious that the "Takil-Issue" is still a marathon, not a sprint as suggested by some of the newer papers.

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Dr. Michael Lorek
Grillparzer Weg 35a
42289 Wuppertal
info@tropengarten.de