

The Ringal of the North-western Himalaya ;

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(Notes on two species of *Arundinaria* suitable for cultivation in New South Wales.)

[Read before the Royal Society of N.S. W., 7 October, 1885.]

Two species of bamboo are known from the higher mountains of the North-western Himalaya: *Arundinaria falcata*, Nees (Munro in Trans. Linn. Soc. XXVI, 26), and *Arundinaria spathiflora*, Trinius, described by Munro under the name of *Thamnocalamus spathiflorus*.

Arundinaria falcata is a small bush, not much over 6 feet high, growing at moist places in the valleys of the outer North-west Himalaya. I have found it in Kell, in the basin of the Bias-River, on tributaries of the Sutlej-River, and in the valleys of Jaunsar, leading to the Tons and Juvara-Rivers. I have never seen it at a higher level than 7,000 feet. The stems are thin and weak, and do not, as far as I know, form any article of trade. The bamboo, which is exported to the plains of Hindustan, and which is made into tubes for water, tobacco-pipes (hookah), fishing-rods, mats, baskets, is *A. spathiflora*, a much larger species, which grows from 8,000 to 10,000 feet. This is the kind commonly known as Ringal, Nagal or Ningala. In the forests of *Cedrus Deodara*, *Cupressus torulosa*, *Abies Smithiana*, *Abies Webbiana* and *Quercus semecarpifolia* it often forms a dense underwood, covering large areas on the ranges between the Rais and Bias, Bias and Sutlej, Sutlej and Tons, and Tons and Jumna Rivers. This bamboo also forms forests of its own, with a few scattered trees. Such a forest, consisting chiefly of *Arundinaria spathiflora*, I found in October, 1874, on the south side of the Kidar-Kanta Peak of the Tiri State, in a moist valley, on excellent soil, and here the stems had attained 30 feet.

Both species have a wide distribution, but as far as is known they are limited to the outer ranges with a moist climate. They have not been recorded from the drier districts beyond the Snowy Ranges. According to Munro, *A. falcata* extends from the Rais to Kumaon, and is again found on the Khasia Hills. As to eleva-

tion, the limits given by him (5,000 to 7,500 feet) accord with my own observations. *A. spathiflora* has its north-west limits on the hills between Rais and Bias, and, according to Munro, is found in Sikkim and Butan. As already stated, its limits of elevation are 8,000 to 10,000 feet.

When I wrote the Forest-Flora of North-western and Central India in 1874, my knowledge of these two species was somewhat imperfect, and the account given of them by me on that occasion was not altogether correct. Since then I have had opportunities of studying them better, and it may therefore not be out of place to give a fresh description. This description is limited to the parts above ground. The rhizoma or underground-stem of these species, like that of the Bambusae, is much branched and twisted; but I am unable to state whether there is any difference in the shape and mode of growth in these two species. From these rhizomas, when fully formed, spring every year a small number of stems, which at first are soft and succulent, unbranched and leafless, but bearing at the nodes large sheaths or spathes, which, while the stems are growing, cover the internodes and overlap each other, giving to the upper portion the appearance of a telescope not quite drawn out. From the axils of these large sheaths spring leaf-bearing branches; and while these develop, the stems harden and become woody. In the case of *Arundinaria spathiflora* the stems last a number of years, and as every year new stems are formed, the clump or cluster of stems, which springs from one rhizoma, gets dense, often containing more than 100 stems. The clumps or clusters of this bamboo stand close together, generally forming extensive thickets, so that adjoining clusters cannot readily be separated. When the stems have attained a certain age, they flower and die after ripening their seeds. I do not maintain that they always flower at a certain age; this probably varies according to circumstances, but this bamboo always flowers over large areas. I have collected flowering specimens in Jaunsar, on the hills between the Tons and Jumna Rivers, at 9,000 feet, in May, 1881, but I have observed the species in flower on several occasions in other places. I am unable to say whether in this species the rhizomes die with the seed-bearing stems. On this as on many other points further observation will be most welcome.

Of *Arundinaria falcata* Munro says that the stems are annual. Royle (Ill. Himal. p. 23) says that the annual stems of the hill-bamboo are yearly beaten down by the fall of snow, which protects its perennial roots from excessive frost. In this passage Royle speaks of a bamboo which grows from 7,500 to 10,000 feet, and which must be *A. spathiflora*, the stems of which, as far as I know, are perennial. *Arundinaria falcata* I have collected in flower and in seed on many occasions; at Chakrata (6,000 feet) in

April, 1881, in the Valley of the Manglad, a tributary of the Sutlej River (6,000 feet) in May, 1881, at Jannsar in September, 1878, and at Kula in October, 1876. I readily believe that in the North-western Himalaya the stems are annual and flower annually, but I have no observations upon the subject.

I now proceed to give a brief account of the characters by which these two species can be best distinguished. *Arundinaria falcata*, Nees : stems 6 feet high ; internodes 6-12 inches long, $\frac{1}{2}$ - $\frac{1}{3}$ inch diam. ; nodes much thickened. Sheaths on young shoots thinly membranous, glabrous, with apex 4-12 inches long, gradually narrowed into a subulate point. Leaves 3-4 inches long, $\frac{1}{4}$ inch broad, glabrous above, with scattered long soft hairs beneath ; midrib prominent ; of the numerous longitudinal nerves 3-5 pair more distinct than the others ; no transverse veins. Apex of sheath without cilia ; ligule small, obtuse. Flower-bearing stems leafless ; numerous slender branches in compact half-whorls. Spikelets $\frac{1}{2}$ - $\frac{3}{4}$ inches long, with 1-2 fertile and one terminal sterile flower. Flowering glume glabrous, 7-9-nerved. Palea as long as flowering glume, two-keeled, with longitudinal nerves outside the keels ; three small fimbriate scales ; style 2-fid to the base.

Arundinaria spathiflora, Trinius.—Stems to 30 feet high ; internodes 6-15 inches long, $\frac{1}{2}$ - $\frac{3}{4}$ inch diam. ; nodes not much thickened. Sheaths on young shoots (spathes) glabrous, coriaceous, narrowed abruptly into a distinct linear caducous apex ; sheaths without apex 6-8 inches long. Leaves 3-5 inches long, $\frac{1}{3}$ - $\frac{1}{2}$ broad, glabrous, with three pairs of prominent longitudinal nerves on either side of midrib ; conspicuous transverse veins dividing the area of the leaf into squares ; leaf narrowed into a short petiole, which is articulate with sheath. Leaf-bearing sheath 2-3 inches long, coriaceous, with prominent longitudinal nerves, fimbriate with long cilia at apex, persistent after the leaves fall, forming an acute angle with the branch. Flowering stems generally with a few leaves ; flowers in long panicles, with elongated drooping branches. Racemes of 2-3 spikelets in the axils of large clasping multinerved leafless sheaths, which are fimbriate at the apex like the leaf-bearing sheaths. Spikelets lax, 1-2 inches long, of 6-8 flowers. Flowering glume hairy outside ; palea much shorter than flowering glume, with 1-2 longitudinal nerves between the keels ; 2-3 falcate scales ; style 3-fid to base, long-plumose.

The bamboo described by Major Madden as *Arundinaria falcata* (Ringal), page 614 of Journal Asiatic Society of Bengal, June 1849, is doubtless *A. spathiflora*, also that mentioned by Dr. Cleghorn as *Arundinaria falcata* and *utilis* from several places in the North-west Himalaya, in his Report upon the Forests of Punjab, 1884. Munro in his Monograph on Bamboos (1868), quotes Royle and Cleghorn under *A. falcata*. Dr. Stewart, in his Punjab-plants,

1869, identifies the Ringal of commerce with *Arundinaria falcata*, Nees ; and, as already mentioned, I did not on page 562 of my Forest-flora (1879) give a completely correct account of these two interesting Bamboos.

Bonn, 18th July, 1885.

Baron Von Müller, in forwarding the above paper of Dr. Brandis to the Hon. Secretary of the Royal Society of New South Wales, refers to the same in the following words :—"These two species of bamboo had been so often found mixed up in works on Botany, that I deemed it advisable to refer the matter directly to the best authority extant, in order to obtain satisfactory information. I, myself, have first introduced into Australia many living bamboo-species, and probably was the first who encouraged their propagation from seed in many parts of the globe. As they are such beautiful and grateful plants, of which there are about 200 species, the publication of Dr. Brandis' important notes on two of the kinds of *Arundinarias* may appear advisable, so as to direct more attention towards them, especially since *Arundinaria spathiflora* is still dragging itself through many botanical works under the name of *Arundinaria falcata*.



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