



Illustrations from:

**A morphological investigation of some Himalayan bamboos
with an enumeration of taxa in Nepal and Bhutan**

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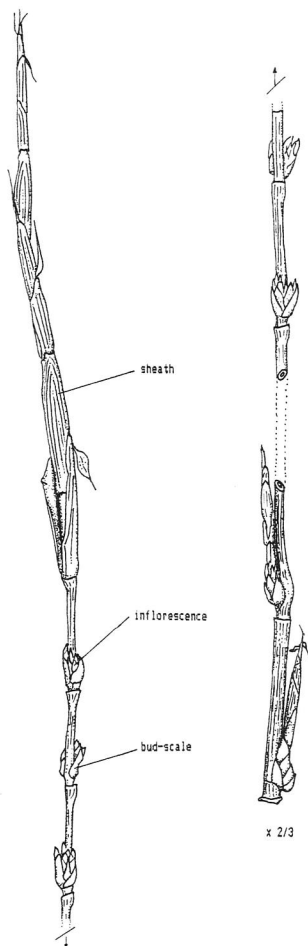


fig 1 Young flowering material required for detailed investigations. Axis of *Dendrocalamus hamiltonii* with sheaths subtending inflorescences still present distally while proximal nodes show young rapidly proliferating inflorescences enclosed in characteristic bud-scales,

fig 2 Contents of young inflorescence bud from *Sambusa tulda* B21, showing 2-keeled bud-scale and 2-keeled prophylls at higher orders of branching,

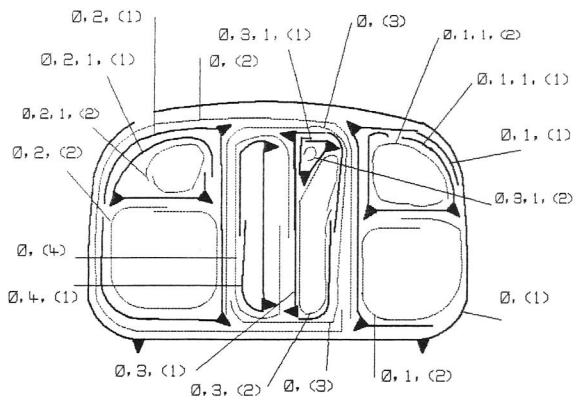
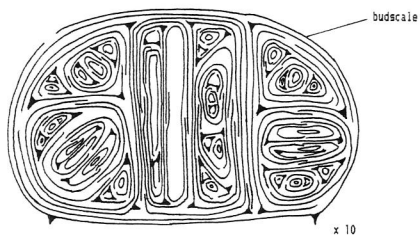


fig 3 Simplified plan of sheaths from lower orders of branching in B21, with axes and sheaths categorised according to the axis from which they arise and their sequence on that axis, x 12

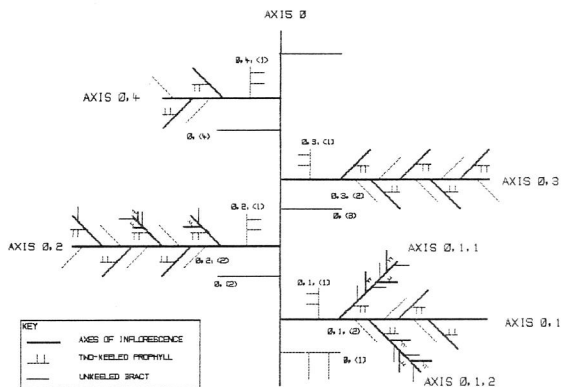


fig 4 Branching pattern and sheaths interpreted from 821 bud contents.

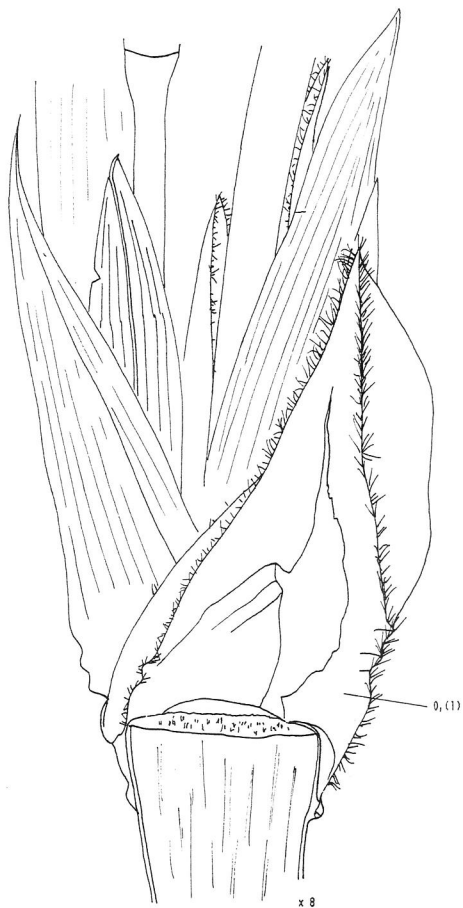


fig 5 B21 bud scale, prophyll 0, (1) enclosing the inflorescence, with 2 ciliate keels,

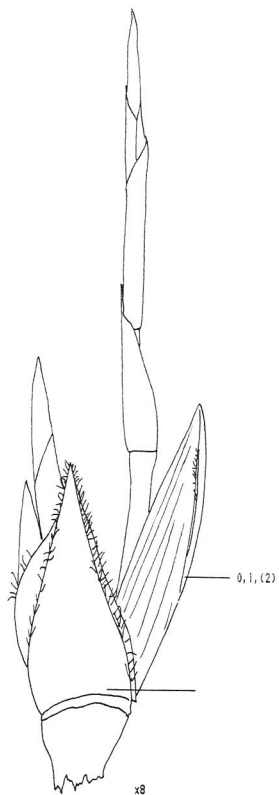


fig 6 Prophyll 0,1,(1) on major lateral inflorescence axis in B21 with following bract 0,1,(2) bearing short partially ciliate keel.

fig 7 Contents of young inflorescence bud from *Sambusa balcooa* D23, showing 2-keeled bud-scale, and some 1-keeled prophylls at intermediate orders of branching,

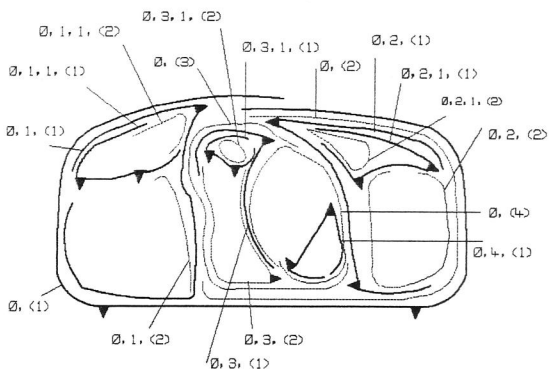
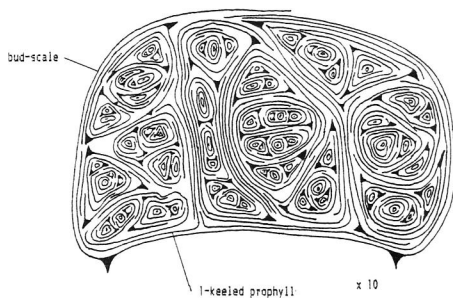


fig 8 Simplified plan of sheaths from lower orders of branching in D23, with axes and sheaths categorised according to the axis from which they arise and their sequence on that axis.

fig 9 Branching pattern and sheaths interpreted from 023 bud contents.

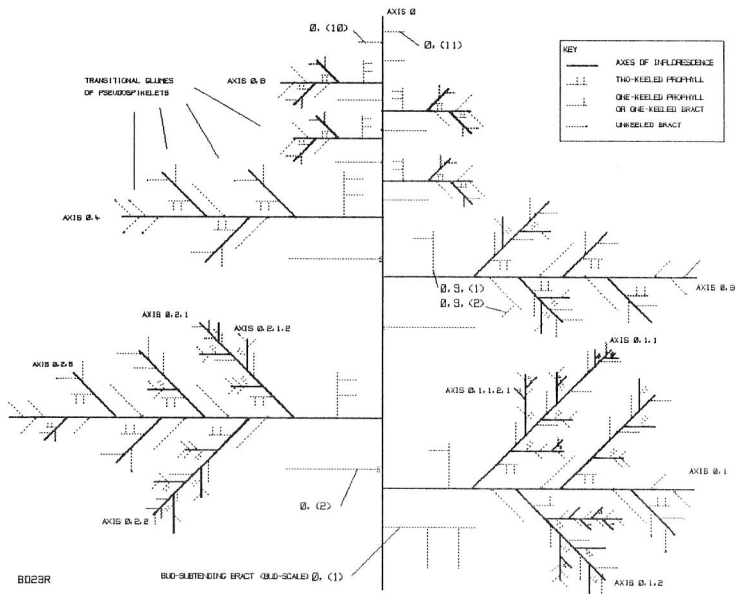


fig 10 Ambiguous bud-scale from intermediate species D23, possibly either composed of two separate sheaths or single sheath split to line of insertion by lateral pressures during ramification.

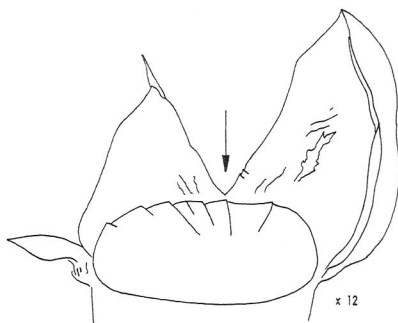
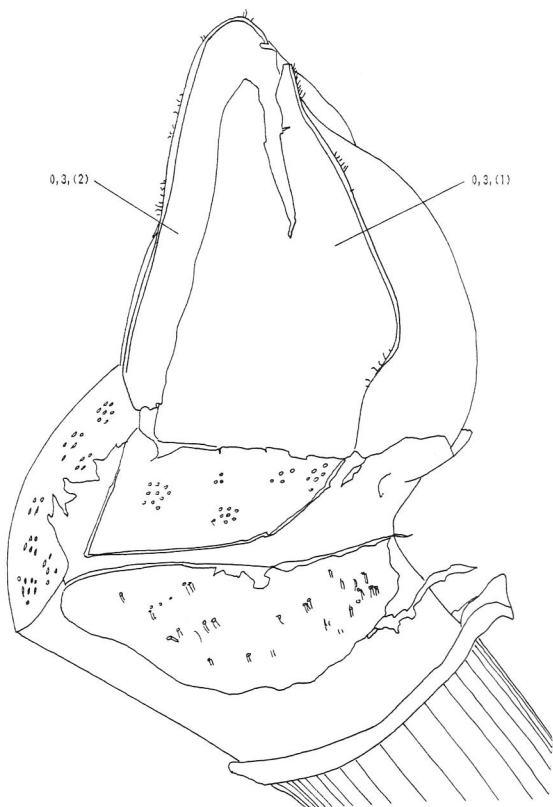


fig 11 Budscale from D23 in which splitting stopped above line of insertion, allowing interpretation of budscale as 2-keeled prophyll 0,(1).

fig 12 Single-keeled prophyll 0,3,(1) with single-keeled following bract 0,3,(2) on lateral inflorescence branch in 023.



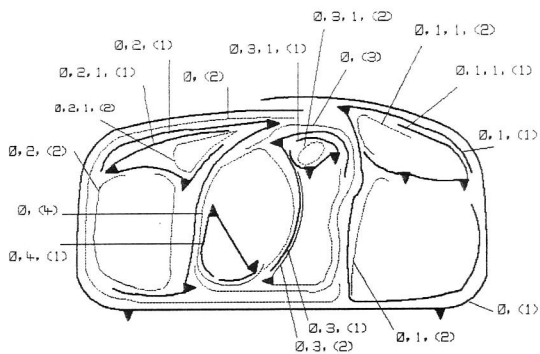


fig 13 Reflection of contents of D23 inflorescence bud for comparison with other species.

fig 14 Contents of young inflorescence bud from intermediate species D21, showing 2-keeled bud-scale, single-keeled prophylls at intermediate orders, and 2-keeled prophylls at higher orders of branching.

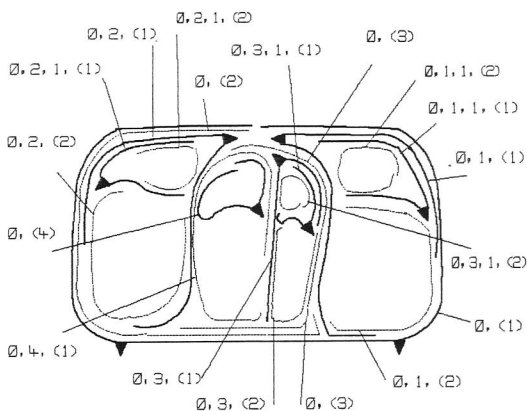
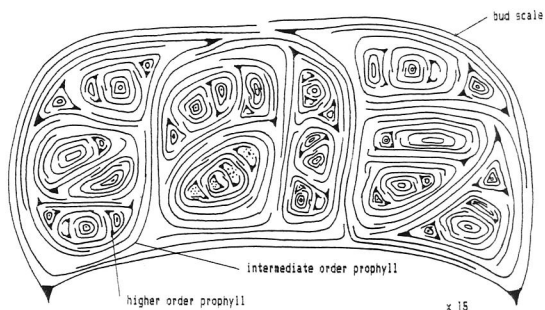


fig 15 Simplified plan of sheaths from lower orders of branching in D21, with axes and sheaths categorised according to the axis from which they arise and their sequence on that axis.

fig 17 Single-keeled prophyll and following sheath from intermediate order of branching in D21,

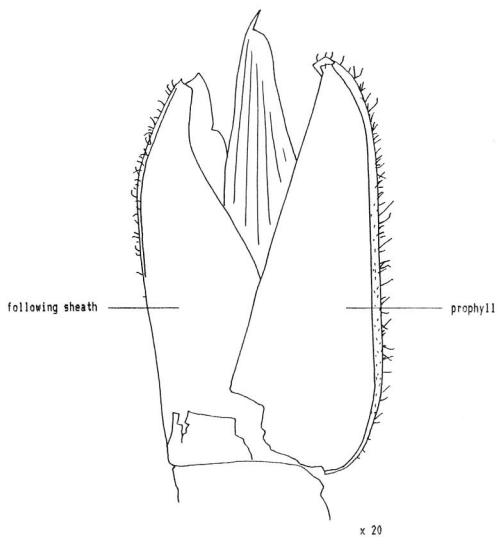
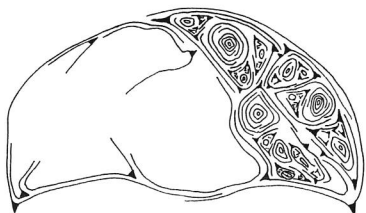


fig 18 Contents of section of inflorescence bud in *Dendrocalamus hamiltonii*, showing single-keeled prophylls throughout.



x 10

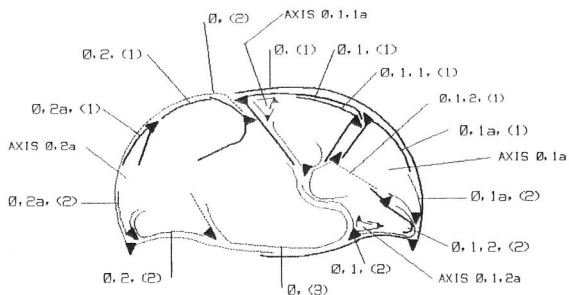
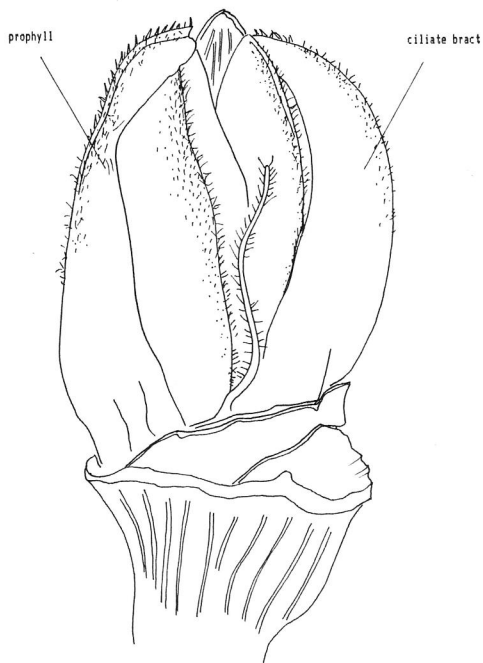


fig 19 Simplified plan of major sheaths in section of *Dendrocalamus hamiltonii* bud, with axes and sheaths categorised according to the axis from which they arise and their sequence on that axis.

fig 21 Duplicated axis 0,1a represented by rudimentary ciliate strand in a *Dendrocalanus hamiltonii* inflorescence, between a narrow single-keeled prophyll and ciliate following bract,



x 20

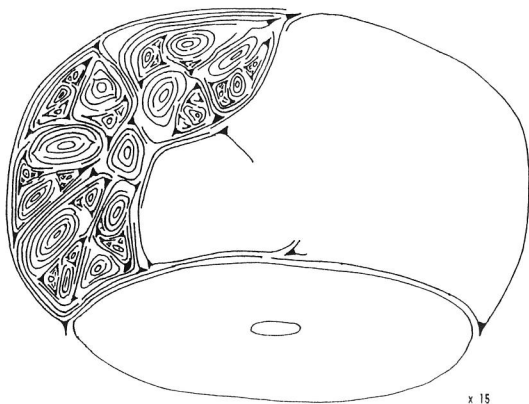


fig 22 Section of *Dendrocalamus hamiltonii* inflorescence with extensive duplication of second order branching.

fig 23 *Dendrocalamus hawiltonii* inflorescence with no duplication of axes except for a rudimentary strand on one side interpreted as axis 0,1a,

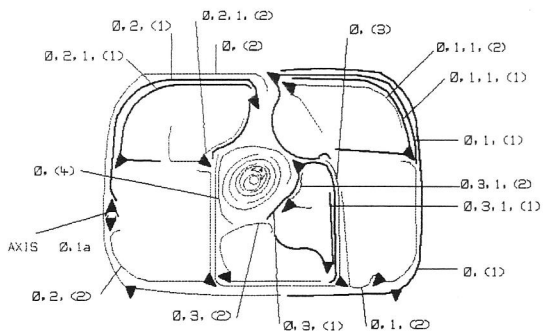
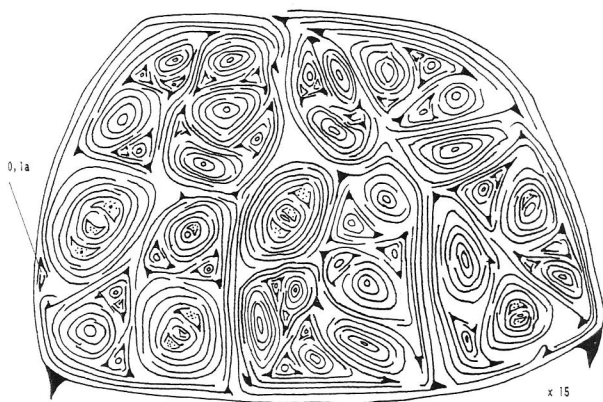


fig 24 Major sheaths in *Dendrocalamus hawiltonii* inflorescence shown in fig 23,

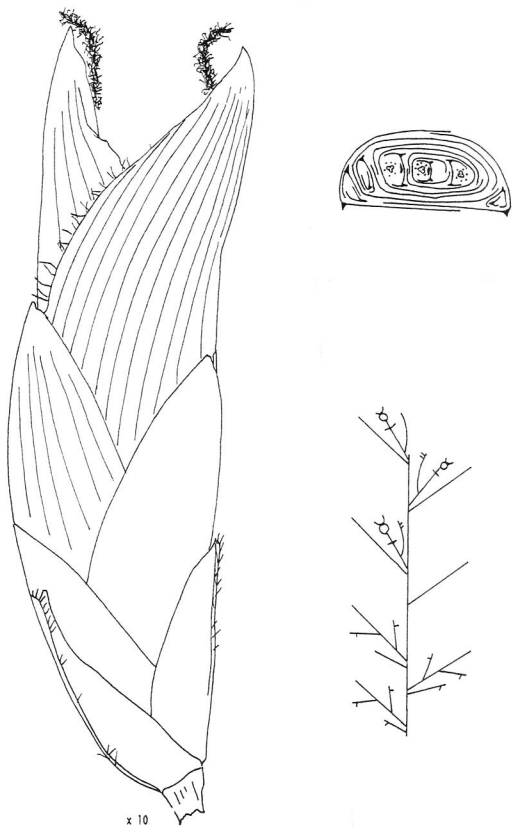


fig 25 *Dendrocalamus hamiltonii* var *edulis* (D46). Pseudospikelet with plan of contents and branching pattern showing single-keeled prophylls.

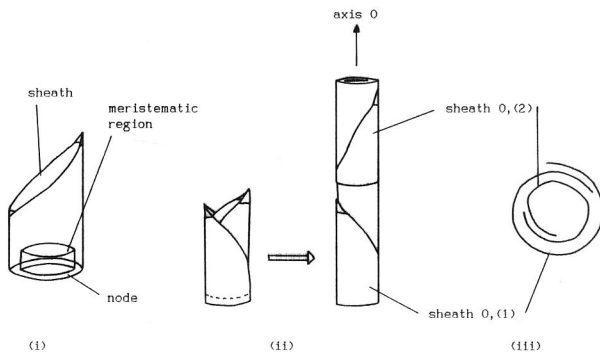


fig 26 (i) Basic unit, (ii) alternate distichous insertion of 2 successive units before and after intercalary growth, (iii) diagrammatic cross-section of (ii)

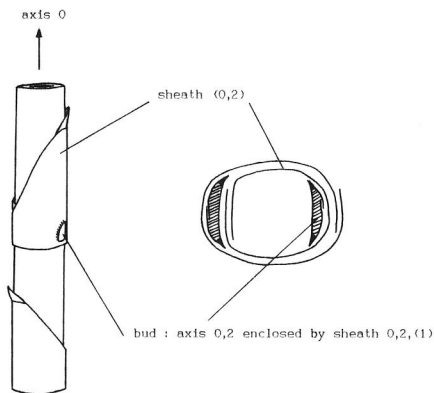


fig 27 Insertion of branch buds in sheath axils and diagrammatic cross-section.

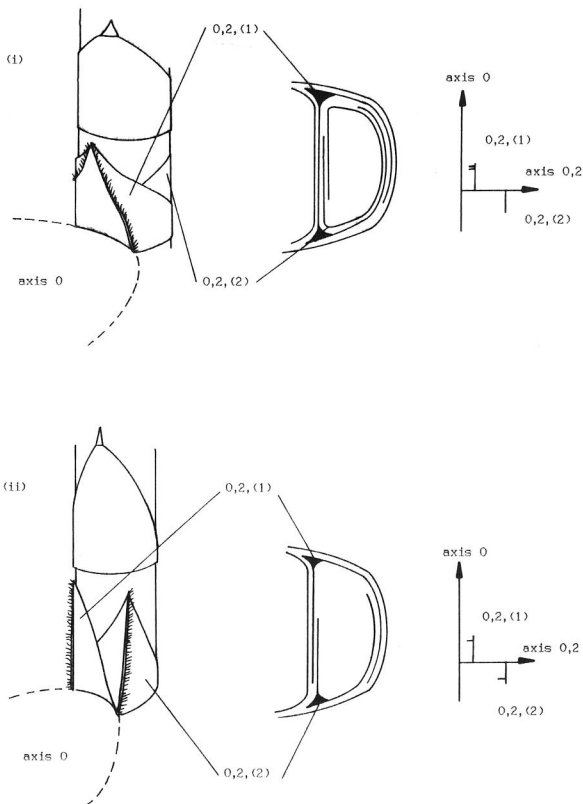


fig 28 Branching of axis 0,2 from axis 0 with filling of gaps by (i) 2 keels on prophyll when sheaths are broad, (ii) 1 keel on prophyll and one on following sheath when sheaths are narrow. Appearance of sheaths, diagrammatic cross-section, and branching pattern.

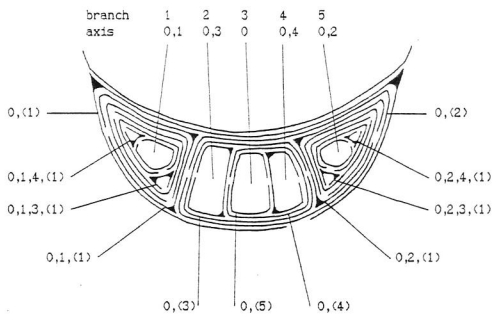


fig 29 Contents of mid-culm branch bud from *Thamnocalamus* species T44. x 15

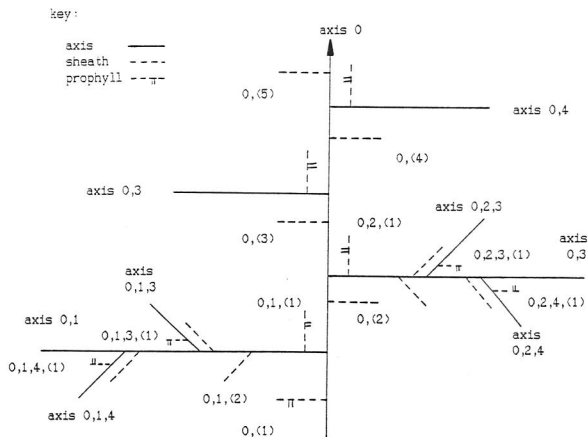


fig 30 Branching pattern and sheaths interpreted from T44 bud contents.

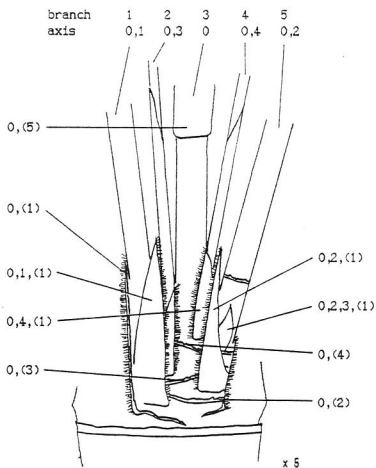


fig 31 Appearance of mid-cula branch complement of *Thamnocalanus aristatus* T44 with front of prophyll and sheaths 0,(2) to 0,(4) removed, showing sheaths subtending all branch axes.

key :

yr 1 axis ———
yr 2 axis - - - -

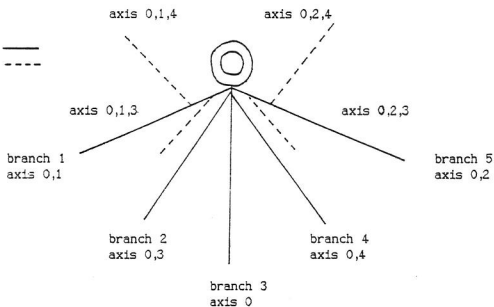


fig 32 Horizontal arrangement of typical mid-cula complement in T44 with branches not extending behind cula until second year of growth.

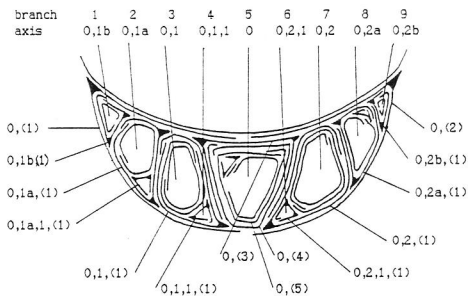


fig 33 Contents of mid-culm branch bud from *Fargesia* species T43. x 15

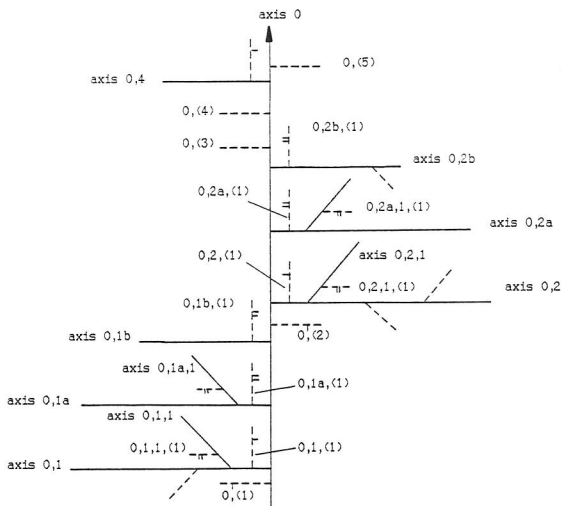


fig 34 Branching pattern and sheaths interpreted from T43 bud contents.

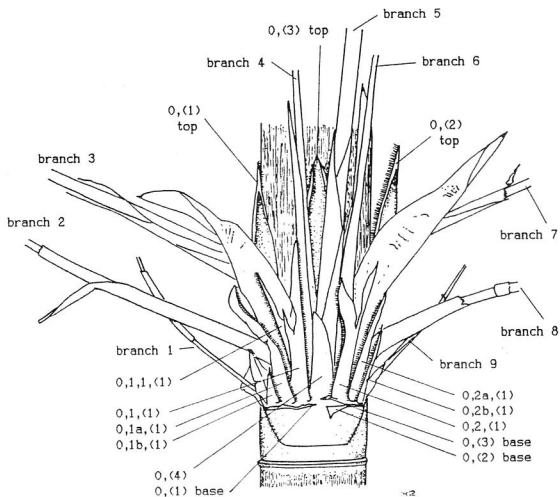


fig 35 Appearance of mid-culm branch complement in *Fargesia* species T43.

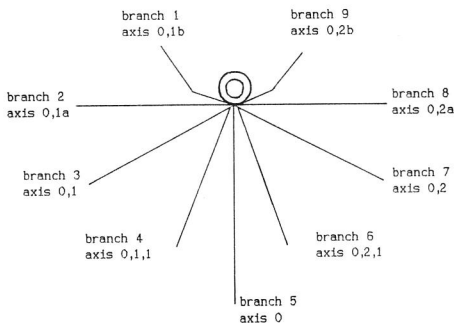
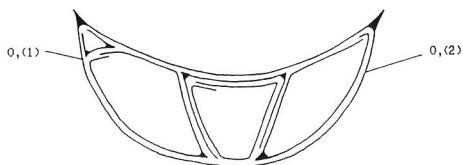
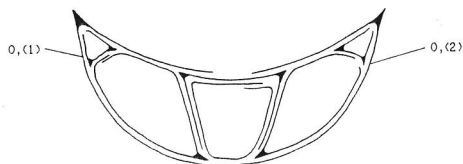


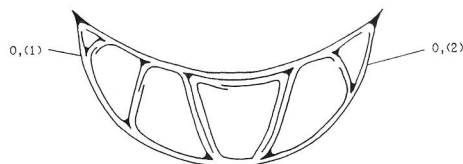
fig 36 Horizontal arrangement of first year mid-culm complement in T43, showing extension of branches behind the culm from the first year.



fused at front and rear



fused at front only



fused at rear only

fig 37 Examples of bud contents at lower culm nodes in *Fargesia* and *Yushania* species, suggesting fusion of prophyll 0,(1) and sheath 0,(2) at front and/or rear to give 2-keeled scales, x 15

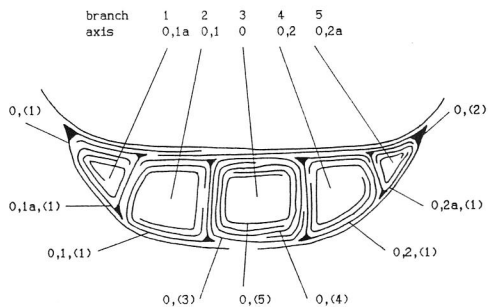


fig 38 Contents of mid-culm branch bud from *Fargesia muriei*. x 15

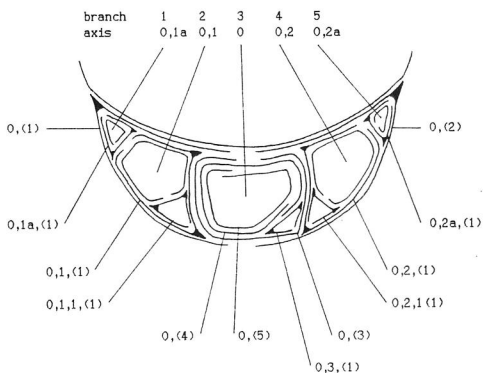


fig 39 Contents of mid-culm branch bud from *Sinarundinaria nitida*. x 15

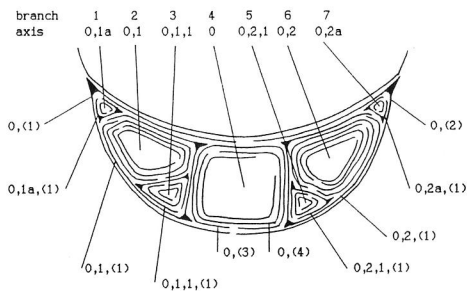


fig 40 Contents of mid-culm branch bud from *Arundinaria hirsuta* T41, x 15

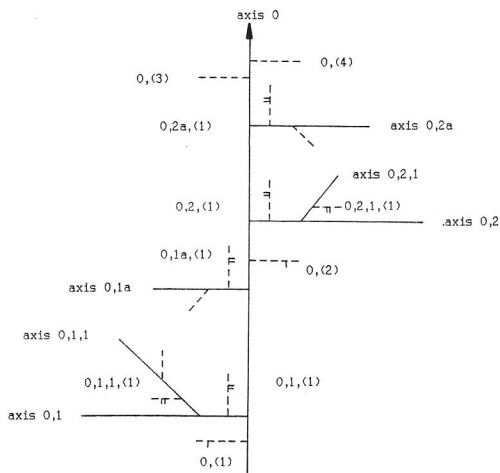


fig 41 Branching pattern and sheaths interpreted from T41 bud contents,

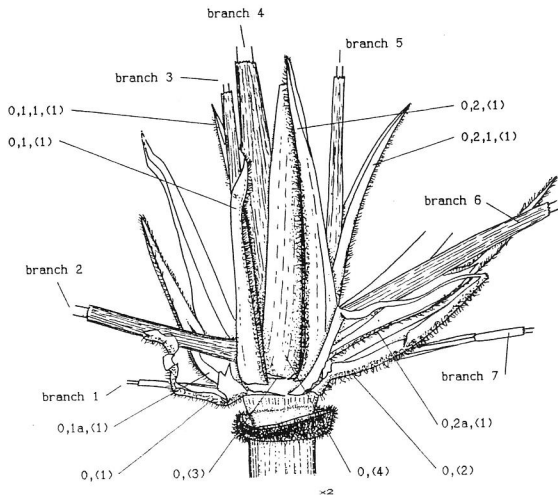


fig 42 Appearance of mid-culm branch complement of *Arundinaria hirsuta* T41, showing major lateral branches 3 and 5 without intervening sheath, suggesting a narrow single-keeled prophyll.

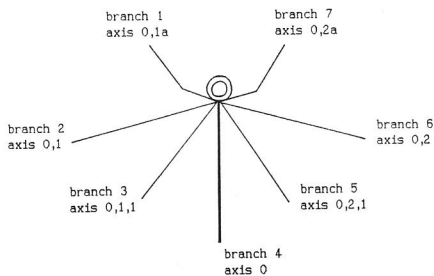


fig 43 Horizontal arrangement of first year mid-culm complement in T41, also extending behind culm in first year, Central branch 4 is large towards culm base, allowing re-iteration after damage,

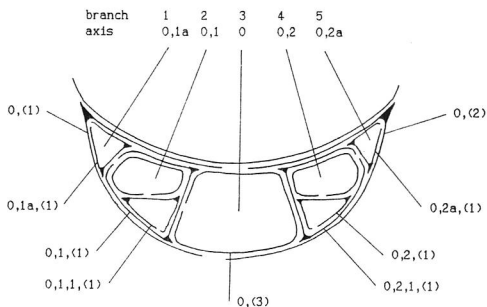


fig 44 Contents of upper culm branch bud from *Arundinaria microphylla* T50. x 15

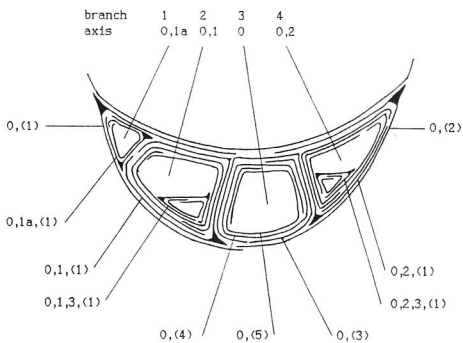


fig 45 Contents of mid-culm branch bud from *Arundinaria naling* T53. x 15

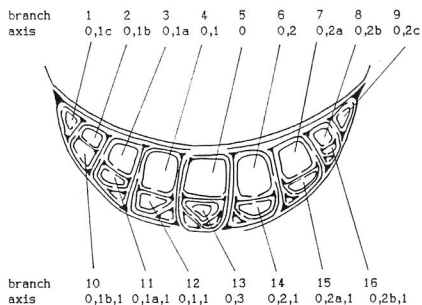


fig 46 Contents of mid-culm branch bud of *Drepanostachyum* species T49. $\times 12$

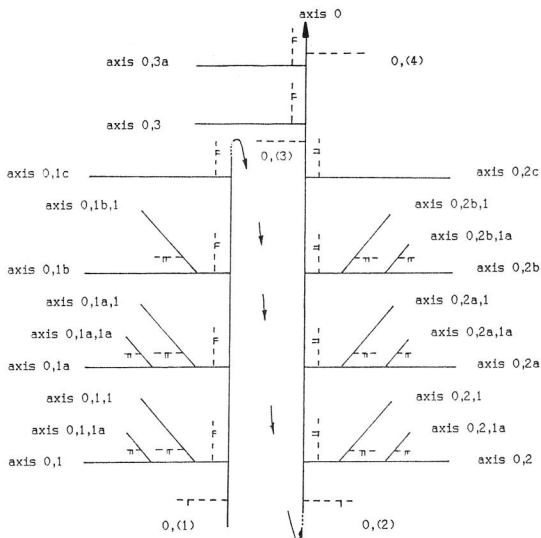


fig 47 Branching pattern and sheaths interpreted from T49 bud contents.

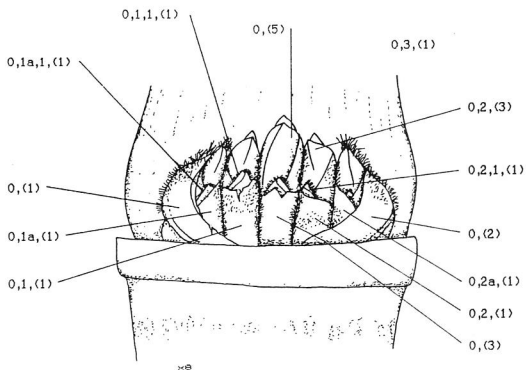


fig 48 Appearance of mid-culm bud in *Drepanostachyum* species T49, showing short bud-scale and abundance of replicated axes arranged in two rows.

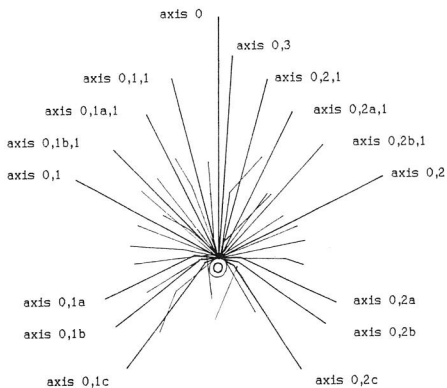


fig 49 Horizontal arrangement of typical mid-culm branch complement in T49, showing verticillate profusion of branchlets.

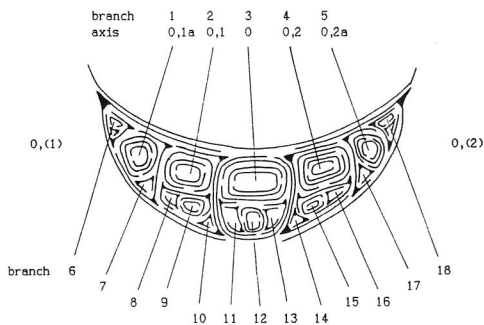


fig 50 Contents of mid-culm branch bud from *Himalayacalamus falconeri* T27, x 10

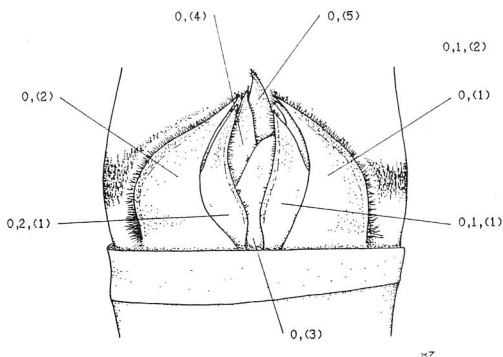


fig 51 Appearance of lower mid-culm bud in *Himalayacalamus falconeri* T27, showing short bud-scales and limited number of initials visible.

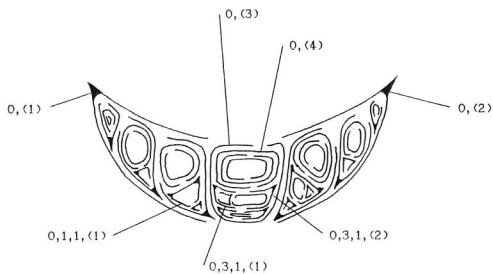


fig 52 Contents of mid-culm branch bud of *Himalayacalanus falconeri* T52, x 10

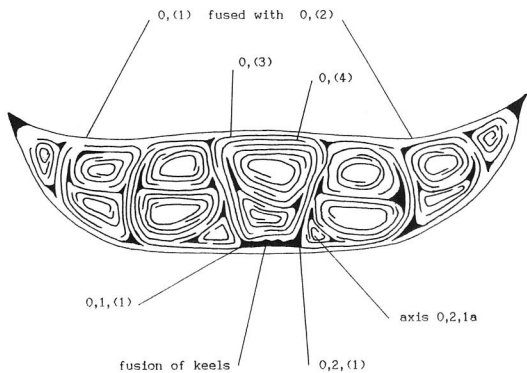


fig 53 Contents of a lower mid-culm bud of *Dendrocalamus patellaris* T3, x 8

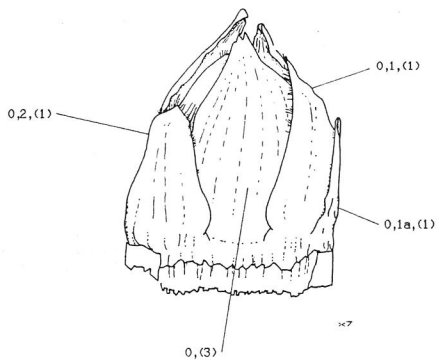


fig 54 Appearance of a lower mid-culm bud of *Dendrocalanus patellaris* T3 with bud scale removed.

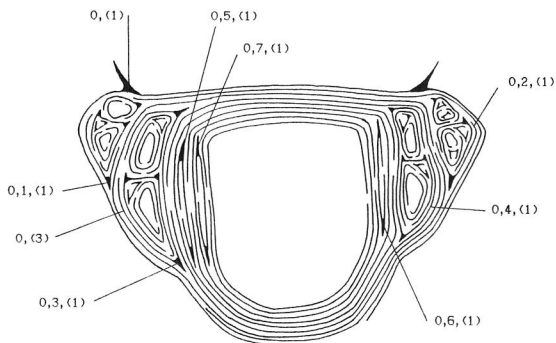


fig 55 Contents of a mid-culm bud of *Neomicrocalanus* species S41, x 10

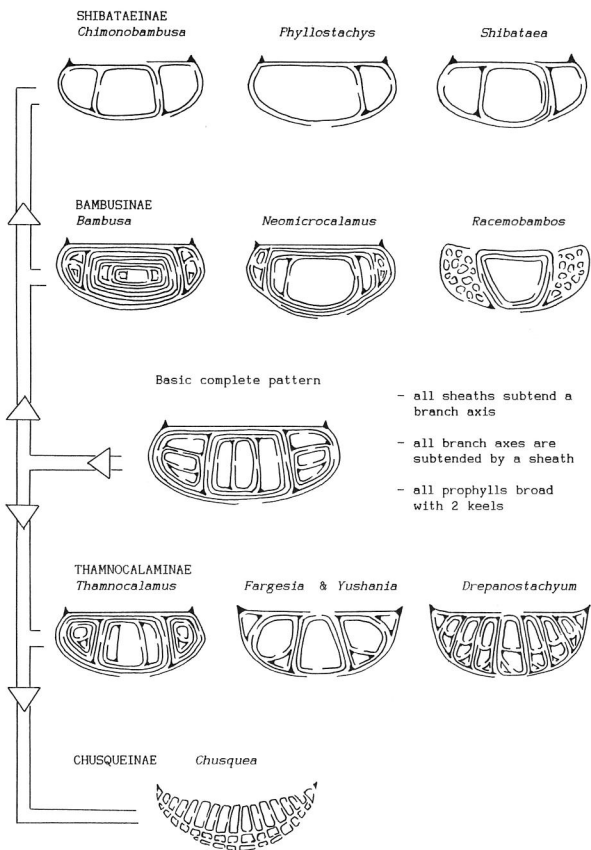


fig 55a Branch complements in four bamboo subtribes, portrayed as bud cross-sections, suggesting different avenues of development.

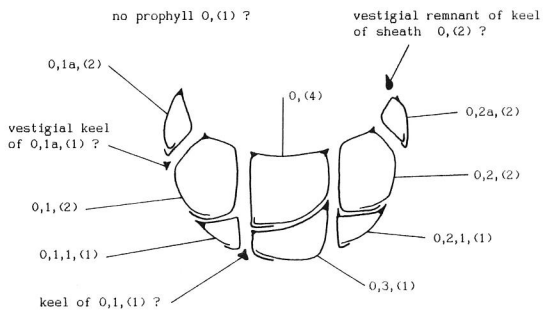
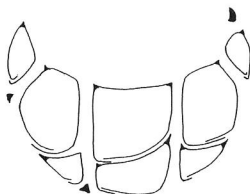


fig 56 Branch complement sheath layout from culm tip of *Chusquea culeou*



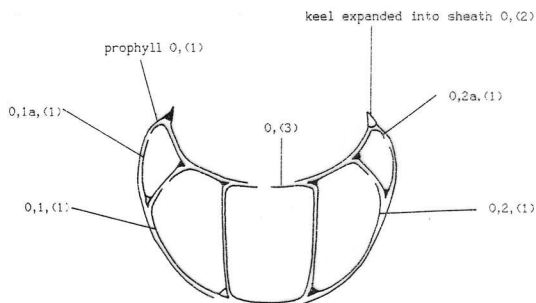


fig 57 (i) (upper layer) Expansion of vestigial keels from fig 56 on both sides with sheath $O, (3)$ added in centre.

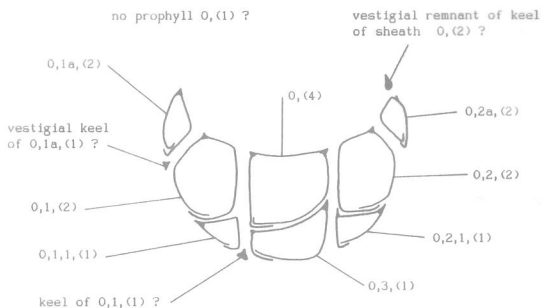


fig 56 Branch complement sheath layout from culm tip of *Chusquea culeou*

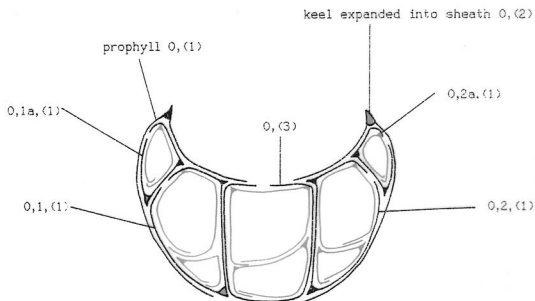


fig 57 (i) (upper layer) Expansion of vestigial keels from fig 56 on both sides with sheath 0,(3) added in centre.

fig 57 (ii) (both layers) Figs 56 and 57 (i) combined, giving sheath layout similar to that of *Fargesia nitida*, as in fig 39.

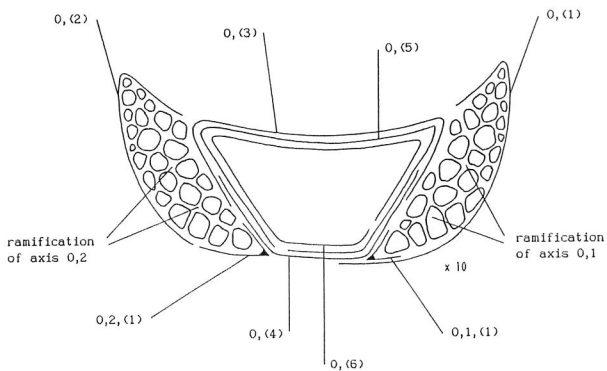


fig 58 Branch complement of *Racemobambos hepburnii* showing narrow sheaths, 0,(1) and 0,(2) without keels, dominant central branch, and proliferation of subequal branches from axes 0,1 and 0,2 without replication.

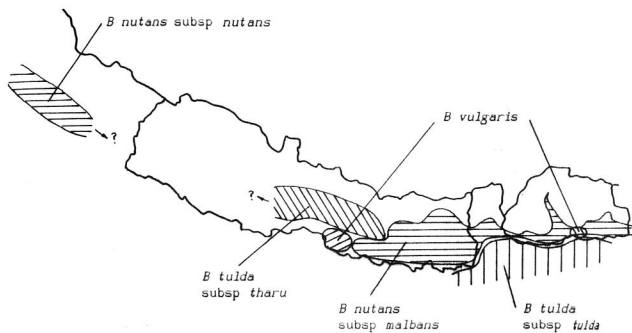


fig 59 Approximate distribution of *Bambusa* species with large auricles

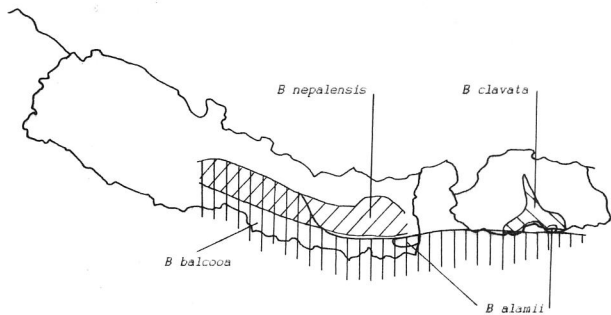


fig 60 Approximate distribution of *Bambusa* species without large auricles and the dwarf species *B. alami*.

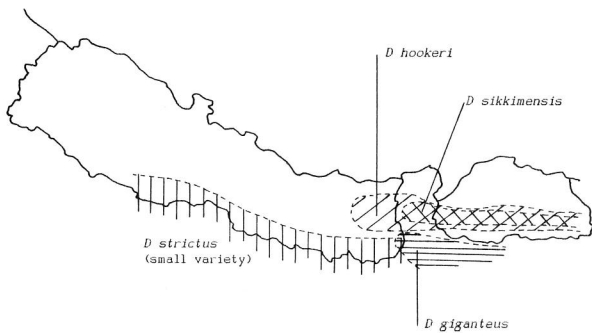


fig 61 Approximate distribution of *Dendrocalamus* species other than *D hamiltonii*

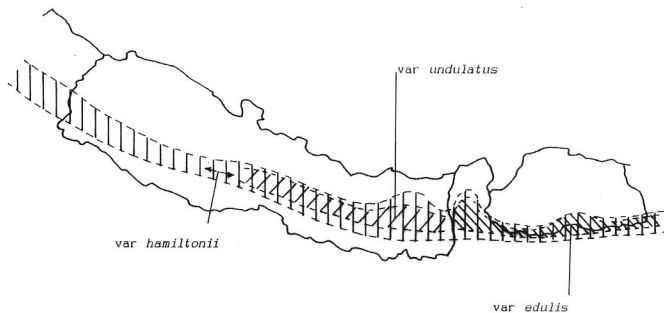
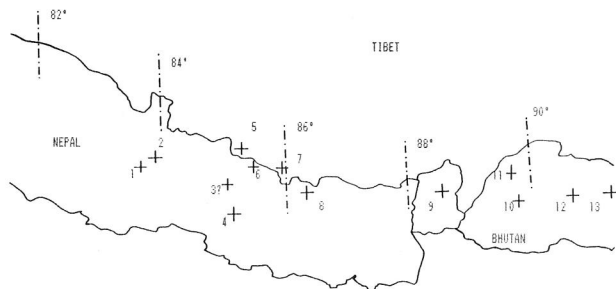


fig 62 Approximate main distribution of *Dendrocalamus hamiltonii* varieties



1	Sayers	2398	Deorali	W Nepal	83,8°	
2	Stapleton	308	Pipar	W Nepal	83,9°	
3	Wallich	5041	?	C? Nepal	c 85°	<i>spathiflorus</i>
4	Stapleton	363	Daman	C Nepal	85,1°	
5	Yi & Da	1	Kyirong	Tibet	85,3°	<i>crassinoda</i>
6	Stapleton	326	Langtang	C Nepal	85,4°	
7	Stapleton	892	Nyalaw	Tibet	85,9°	
8	Stapleton	355	Marbu	C Nepal	86,4°	
9	Gamule	s n	Phalut	Sikkim	88,5°	<i>aristatus</i>
10	Stapleton	871	Dorchula	W Bhutan	89,7°	
11	Stapleton	803, 804	Koena	N Bhutan	89,8°	
12	Stapleton	851, 413	Yotong La	C Bhutan	90,6°	
13	Ludlow, Sherriff, & Hicks	20531	Donga La	E Bhutan	91°	

fig 63 Locations of collections of *T. spathiflorus*, *T. aristatus*, *F. crassinoda*

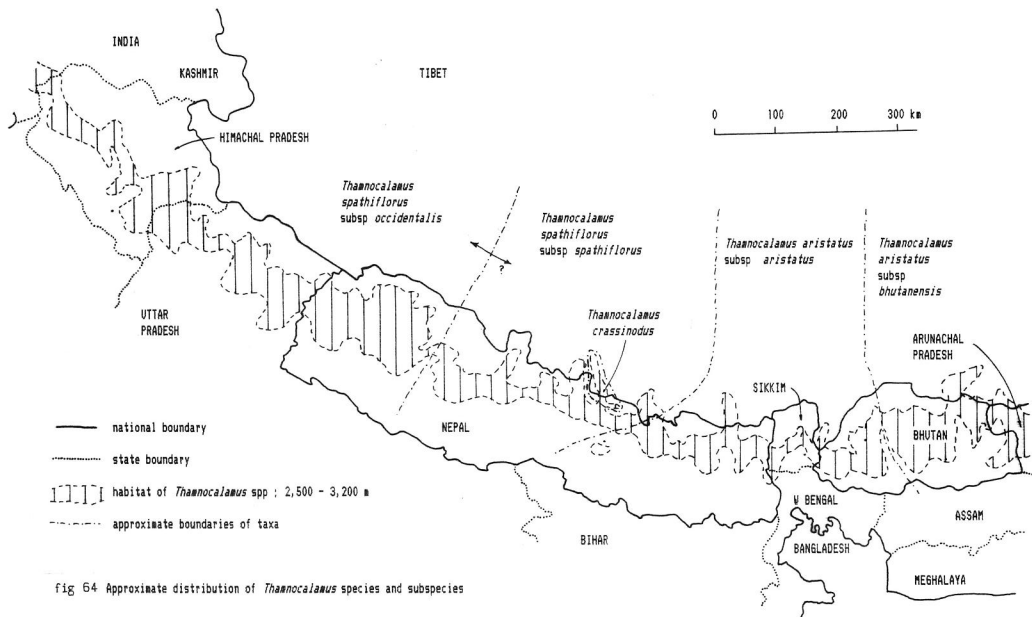


fig 64 Approximate distribution of *Thamnocalamus* species and subspecies