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Ethnobotany of the Tari Basin, Southern Highlands Province, Papua New Guinea.

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ETHNOBOTANY OF THE TARI BASIN

Introduction

The natural vegetation of New Guinea is extremely diverse, with many different plant communities occupying the varied terrain from coastal flats to high mountain slopes (Paijmans, 1976). The Huli people occupy the Tari Basin and adjacent limestone valleys and slopes at altitudes between 1600m and 2700m in the Southern Highland Province of Papua New Guinea. Swampland, grassland, gardens and regrowth forest form a mosaic of vegetation types at the lower altitudes while forest covers most of the steep slopes and ridges. The surrounding mountains are primarily of volcanic origin and rise to around 3560m.

This contribution to the botany and ethnobotany of the area brings together a number of diverse botanically related studies conducted over the last 25 years and is designed to be of general interest to researchers working in the region. *Ethnobotany of the Tari Basin, S.H.P., Papua New Guinea*, is a compilation of species known to occur within the basin and incorporates into this list information on life form, Huli name and potential use by the Huli. The variety of plant life within the basin is brought out by the fact that there are at least 1162 different species present and that probably over 30% of these are used in some way by the Huli. Classification of different plants is based primarily on form. There tends to be a direct relationship between the economic value of a given plant and recognition of varieties by the Huli of that plant. Sweet potato (*Ipomoea batatas*) has at least 171 Huli names recorded and are distinguished on characteristics such as, tuber colour and size and leaf shape. *Pandanus julianettii* and Taro (*Colocasia esculenta*) are two other examples of plants that have undergone detailed varietal classification by the Huli. Data on the collectors and herbarium numbers has also been included in the lists as a general indication of collection location and habitat. The complete database can be downloaded as a Filemaker Pro 5 file from palaeoworks.anu.edu.au.

Vegetation of the Tari Basin

The documentation of present-day potential plant resources in the Tari Basin and the known uses of some of these plants is essential for our understanding of how the Huli exploit the resources available in the basin. In this section a general description of the vegetation communities is given and reference is made to several different zones of vegetation. The terminology and classification of vegetation varies from author to author though in this section I follow that used by Kalkman and Vink (1970) and Robbins and Pullen (1965) where appropriate.

Below 1500m, in valleys

Most of the terrain around the Tari basin is above 1500m altitude though there are several limestone valleys adjacent to the basin that lie below this altitude and are occupied by scattered communities of Huli people. Most of this area is covered by mixed forest with dense undergrowth. Frequent canopy trees are *Castanopsis*, *Lithocarpus*, *Elaeocarpus*, Meliaceae, Lauraceae, Sapotaceae and Leguminoseae. In the Komo valley region *Araucaria hunsteinii* forms a pure emergent stand 50 to 70 m in height above the closed canopy of generally broadleaf species.

Anthropogenic grasslands generally dominated by *Imperata* sp. are mostly restricted to the lower flats of the valleys as the valley slopes are to steep for gardening. *Imperata cylindrica* and *Ischaemum polystachyum* occur in lush communities and are an excellent roofing material, regularly gathered from areas in the Komo Valley. The gardens in this zone are generally mixed with *Ipomoea batatas* dominant. *Pandanus conoideus* ("marita") is an important crop plant traded into the Tari Basin. It is probable that the lower altitudes have a much greater botanical value to the Huli than do the higher altitudes if only because of the greater variety in genera available at these lower altitudes.

Between 1500m and 2650m, in the basin

The Huli people occupy the volcanic Tari basin where swampland, grassland, gardens and regrowth forest forms a mosaic of vegetation types in the lower parts. Forest covers most of the steeper slopes and ridges. Most forest within the Tari Basin have been disturbed in some way by pigs or the removal of large trees for construction and firewood. Wood (1984) recognises two major forest types in the basin. At lower altitudes the forest is dominated by *Castanopsis*, *Lithocarpus*, *Conandrium*, *Sloanea* and *Symplocos*. At higher altitudes around the northern parts of the basin, forests have a more mixed composition with *Astronia*, *Cryptocarya*, *Elaeocarpus*, *Beilschmiedia*, and *Planchonella* dominant. Most of these species provide useful building materials. Further variants of forest vegetation occur in restricted areas throughout the basin. On the rugged limestone ridges in the west and north, *Nothofagus* is the dominant species. These steep limestone ridges are generally not suitable for cultivation, so they remain forested. Compared to other populated valleys in the highlands, such as the Wahgi and Goroka Valley, the Tari Basin is well forested and the population have ready access to forest resources nearby settlements.

Small areas of relatively mature forest occur on the basin floor near areas of high population and seem to have been preserved for ritual purposes. This land is never cultivated and is taboo to women and married men. Young bachelors undergo ritual training in the seclusion of these forest. The sites are often dominated by *Castanopsis* with a dense understorey. Small stands of *Araucaria cunninghamii*, usually planted in straight lines, are also associated with sacred sites where exchange, expression of alliance, initiation of young men and

sacrificial offerings took place. Most of the *Araucaria* stands have now been destroyed.

Bog or swamp forest occurs near Tari and in the Levani Valley. These communities are rich floristically with trees such as *Carpodetus*, Myrtaceae, *Glochidion*, *Homolanthus*, *Maesa*, *Pandanus* and locally *Nothofagus* forming a variable canopy. Conifers such as *Dacrydium* and *Podocarpus* are also common. Beneath the canopy a dense layer of small trees and shrubs is found. The floor remains relatively open with irregular hummocks separated by water pools. The swamp forests dominated by conifers are suggested by Robbins and Pullen (1965) to have arisen through the selective action of extreme frosts which kills the broadleaf dicotyledonous trees allowing the conifers to pioneer the site. Johns (1980) suggests an alternative hypothesis that *Dacrydium* swamp forests are possibly an early stage in the development of a mixed montane swamp forest. It is probable that any substantial alteration of the prevailing hydrological conditions would result in the destruction of this distinctive forest type. Drainage of the surrounding swamplands for agricultural development is one mechanism by which such forests may be destroyed.

Forest regrowth in the basin is relatively restricted as most of the successional vegetation following forest clearance appears rarely to return to forest, but remains as tall *Miscanthus floridulus* grassland. Regrowth contains a mixed association of species including *Macaranga*, *Dodonaea*, *Albizia*, *Euodia*,*Prunus*, *Wendlandia*, *Eurya* and *Glochidion.* A most interesting regrowth vegetation is found on some abandoned slope gardens throughout the basin where *Dodonaea viscosa* forms an almost monotypic even age fallow community where soils have been degraded by erosion. This community appears to be an early phase in the fallow vegetation succession and may even develop instead of, or before, the *Miscanthus* grassland phase.

Most of the forest within the basin has been replaced by anthropogenic grasslands. Wood (1984) and Powell and Harrison (1982) discuss these communities at length and show that the fallow succession occurs as shown in Table 1. Occasional fires, the activities of rooting pigs and low soil fertility prevent the regeneration of forest.

It is not clear whether the apparently stable tall grassland community would ever revert to forest if the disturbance factors were excluded. Robbins (1960) regards the tall grassland community to be indicative of recent or infrequent clearance and burning activity and that the community will eventually develop a complete forest cover. Walker (1966) considers that *Miscanthus* grasslands may be a permanent formation. Given continued disturbance and poor soil fertility it is most improbable that there will be regeneration of forest in the grassland areas of the Tari Basin.

Table 1. Fallow vegetation succession in the Tari Basin.
(after Powell and Harrison, 1982 and Wood, 1984)

Time	Vegetation Community	Dominant Genera dry	wet
< 6 months	Garden Regrowth	*Ischaemum*	*Leersia*
		Imperata	*Commelia*
		Setaria	*Polygonum*
		Digitaria	
		Paspalum	
		Crassocephalum	
		Erigeron	
		Ageratum	
		Bidens	
1-4 years	Short Grass Fallow	*Imperata*	*Ischaemum*
		Ischaemum	*Leersia*
		Setaria	*Coix*
		Commelia	*Schoenoplectus*
		Paspalum	*Polygonum*
		Erigeron	
		Ageratum	
		Bidens	
		Urena	
3-5 years	Short Grass Fallow with trees	*Melastoma*	*Ischaemum*
		Dodonaea	*Ludwigia*
		Alphitonia	*Oenanthe*
		Eurya	*Polygonum*
		Imperata	*Kyllinga*
		Ischaemum	*Schoenoplectus*
> 5 years	Tall Grass Fallow	*Miscanthus*	*Ischaemum*
		Melastoma	*Leersia*
		Eurya	*Kyllinga*
		Wendlandia	*Schoenoplectus*
		Dodonaea	*Ludwigia*
		Macaranga	*Polygonum*
		Schuurmansia	*Floscopa*
		Gleichenia	*Liphocarpha*

The extensive swamplands in the Tari Basin generally support a short grass community dominated by *Leersia hexandra*. Other grass species include *Saciolepis myosuroides*, *Dicanthium aristatum*, *Coix lachryma-jobi* and *Coix gigantea*. The sedges and herbs include *Schoenoplectus mucronatus*, *Xyris capensis*, *Cyperus* sp., and *Pycreus* sp.. *Phragmites karka* is found in the drier areas of swamps.

Between 2650m and 2800m, in the plains

The grasslands that dominate this zone are situated in uninhabited undulating valleys and are regularly fired by parties walking through the area for hunting or to tend *Pandanus brosimos* sites located in the forest at higher altitudes. The grassland structure is related to the topography and overlying fire patterns (Gillison, 1969, 1970). Some of the locally dominant species are: *Imperata cylindrica*, *Danthonia archboldii*, *Machaerina rubignosa*, *Gahnia javanica*, and *Pteridium aquilinum*. Shrubs such as *Styphelia*, *Rhododendron*, *Xanthomyrtus* and *Eurya* are able to survive repeated burning. Along natural drainage lines the fire-resistant treefern *Cyathea atrox* var. *inermis* is very common. In lower parts cyperaceous swamp communities develop with *Juncus* and *Machaerina* dominant. *Hypericum* and some ferns are also present. Gillison (1970) suggests that the grassland formation, under prolonged absence of firing, would be likely to revert to complete forest cover.

Between 2800m and 3565m, on mountain slopes

An account of the vegetation is given by Kalkman and Vink (1970). The forest around the mountains above 2800m is floristically quite distinct from lower regions. *Nothofagus* dominated forests (*N. grandis* and *N. pullei*) are common in the region, interspersed with mixed broadleaved forest and coniferous mixed forest. There is a considerable degree of variation from slope to slope. This is in part related to past disturbance by cutting and burning. Genera that are abundant within the canopy include, *Dacrycarpus*, *Libocedrus*, *Elaeocarpus*, *Sericolea*, *Bubbia* and *Saurauia*. *Weinmannia* occurs in high frequencies in disturbed patches. The distinctive groves of *Nothofagus* appear to be the result of infrequent but large scale disturbance (Read, Hope and Hill, 1990). Natural disturbance factors such as volcanic ash fall, lightning strike and frost damage may play an important role in the formation of these communities (Johns, 1986).

Towards the summit of the mountains, above 3200m, can be found open grassland and shrubland that are the result of frequent burning by hunting parties. The vegetation communities are generally dominated by *Gahnia*, *Danthonia*, *Deyeuxia*, *Gleichenia*, *Haloragis*, *Eriocaulon*, and *Plantago*. Immediately below this is a distinct but variable stunted mossy forest. This zone appears to be controlled by prolonged daily cloud cover. The community is floristically similar to the tall forests at lower altitudes though *Pandanus* and *Nastus* are generally absent. Disturbance due to firing and clearance appears to be absent in this zone.

Botanical Exploration of the Tari Basin Region

Results from several different collection expeditions were used to compile the botanical tables. Botanical exploration in the basin covers a large altitudinal section of the basin (1600m - 3560m), as well as many different environments. The aims of these studies were varied and included botanical, geographical,

palaeoenvironmental and anthropological research. Figure 1. gives the general location of eight main botanical studies conducted in the region. Figure 2. summarises the altitudinal coverage of these botanical studies. It is clear that studies have concentrated around the township of Tari and on the volcanic peaks of Mt Ambua and Mt Kerewa. Very little botanical work has been done around the southern margins of the basin towards Mt Sisa and Lake Kutubu where preliminary observations by the author, and others, suggest a wealth of botanical resources differing from those available to the Huli within the Tari Basin.

A summary of botanical exploration with the area is given below in chronological order.

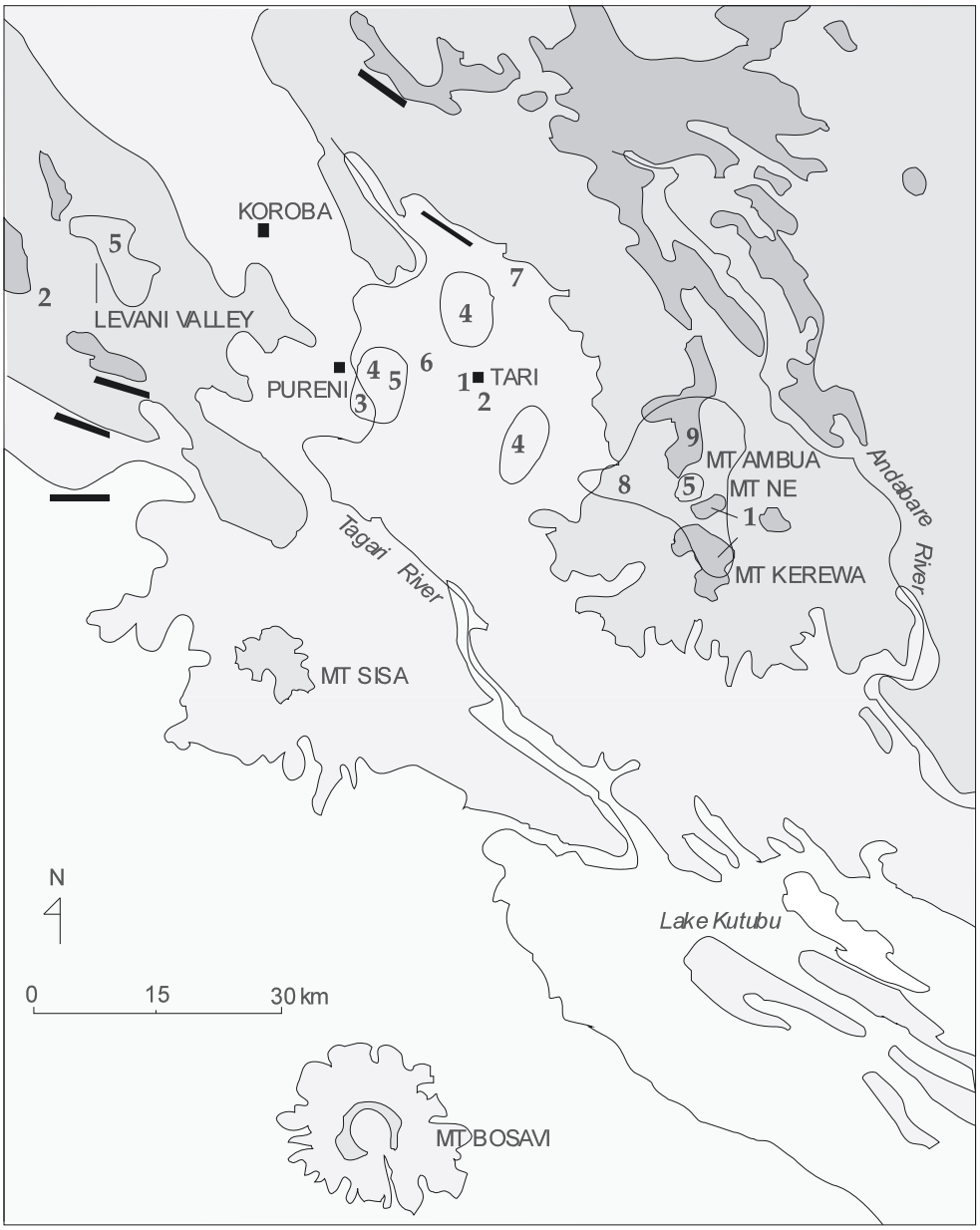
1960-1 R. Robbins and R. Pullen were two of the earliest botanists to enter the basin. Their research was part of a wider study of land systems in Papua New Guinea by the CSIRO during the 1960's (Robbins and Pullen, 1965). They collected around 200 specimens from the Doma peaks region and the basin floor. The collections of Robbins and Pullen are in the N.G.F. series and held at Lae and CSIRO Herbarium, Canberra. None of this collection are included in this list.

1966 The first major botanical exploration in the region was a joint undertaking of the Rijksherbarium, Leiden, The Netherlands and the Division of Botany, Department of Forests, Lae, Papua New Guinea. Members of the expedition included C. Kalkman and W. Vink from Leiden and A. Gillison, D. Frodin and J. Kaibua from the Division of Botany. Descriptions of this expedition can be found in Kalkman and Vink (1970) and Gillison (1969, 1970).

The majority of collections were made in the Mt Ambua, Mt Kerewa and Mt Ne region which lies between 2700m and 3560m. A few collections were made lower down in the Habono and Tigibi area by Frodin and Gillison. The primary aim of the expedition was to collect vascular plants for the purpose of floristic comparison and semi-quantitative work. Gillison (1969, 1970) studied the grassland mosaic and fire succession in the grassland region between Mt Kerewa and Mt Ambua showing that this open vegetation was the result of long term firing by humans. There is very little mention of the potential use of plants or the names given to these plants by the Huli. This is the largest collection to be made in the area with a combined total of 2050 plants collected. The collections of Kalkman and Vink are held at Leiden. The collections of Frodin and Gillison are in the N.G.F. series, Lae.

1970-75 J. Powell worked extensively on the agricultural systems, food production and consumption and other aspects of subsistence around the Haeapugua (or Haiyapugwa) Swamp region that lies about 10 km west of Tari at 1650m. Powell (1976a, 1982) presents detailed data on a range of plants used and the names given to these plants by the Huli in the region. This data is also incorporated into a New Guinea wide ethnobotanical study in Powell (1976b). Some of the plant collection may be found at UPNG herbarium and in Lae.

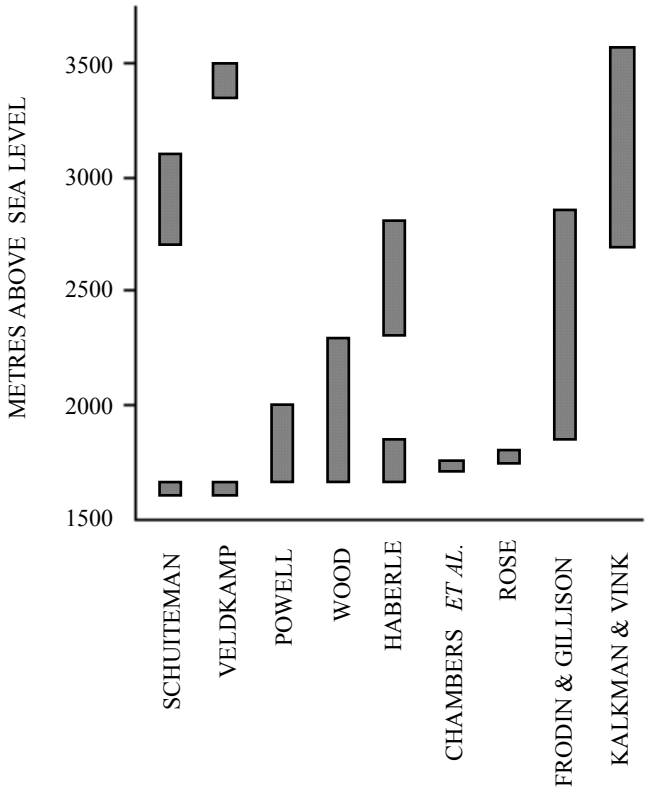
Figure 1. Location of botanical collections, Tari Basin.



Dashed lines give a general indication of the area covered by the larger surveys. Single numbers denote small collections.

1. A. Schuiteman, 1990
2. J. Veldkamp, 1981
3. J. Powell, 1970-75
4. A. Wood, 1978-80
5. S. Haberle, 1989-90
6. M. Chambers *et al.*, 1983
7. C. Rose, 1976-80
8. A. Gillison and D. Frodin, 1966
9. C. Kalkman and W. Vink, 1966

Figure 2. Elevation of botanical surveys by sources.



1970-72 B. Gray conducted some of the first forest resource surveys in the region, during the early 1970's, with particular emphasis on the two *Araucaria* species growing in the highlands (*A. cunninghamii* and *A. hunsteinii*; see Gray, 1973). Both species occur in the Tari region and the extensive stands are now harvested by independent sawmill operators.

1976-80 C. Rose (1982) conducted extensive long term studies on the karuka nut (*Pandanus julianettii*). The surveys were carried out in the Hariba and Habono region about 10 km north of Tari township. Collections may be found at Lae.

1978-80 A. Wood worked on a land use, population and soil survey in the Tari Basin, incorporating studies of vegetation associations with differing soil types and environmental zones. Wood (1984) includes a list of plant species collected in the Tari basin with Huli names. The collection may be found at Lae or UPNG.

1980 R. Johns conducted surveys, with students from the Lae UniTec, of *Dacrydium* swamp forests in the Southern Highlands concentrating on the stands

around Mendi. He also mentions a similar swamp forest to be found near Tari (Johns, 1980).

1981 J. Veldkamp made a small collection from Mt Bituba (3420m), 40 km west of Tari township, concentrating primarily on alpine grassland communities. A few specimens were collected from around Tari township. The collection is held at Leiden.

1983 M. Chambers *et al.* conducted the first limnological study of Lake Wololo (5 km west of Tari township) and Lake Wongabi (15 km west of Tari township). The survey included the collection of aquatic plants from these lakes. The specimens are held at UPNG herbarium.

1987 J. Read studied beech (*Nothofagus* sp.) forests in the Tari Gap region.

1989-90 S. Haberle worked on a palaeoenvironmental study incorporating data on modern vegetation communities in the basin. Collections were made at Haeapugua Swamp, Doma Peaks and Levani Valley. Data on Huli names and use were also included in the survey. Collections are held at Lae and some at Leiden.

1990 A. Schuiteman collected Orchids primarily from the Doma Peaks region and some from the Tari township area. Collections are held at Leiden.

1990-91 C. Ballard recorded a number of Huli plant names as part of a project dealing with construction and ownership of gardens in the basin. Most of the names were recorded in the Hiwanda-Walete region.

Several other botanical expeditions have been made to the region but are not included in this list. These include field study trips made by students from the UPNG and University of Technology, Lae, to the Tari Gap grasslands. These collections may be kept at the respective university herbaria. A few names have been recorded by anthropologists and included in the list (Goldman, 1983 and Frankel, 1986). Rule (1977) also included a few Huli names for plants as part of a comparitive language study.

BOTANICAL RESOURCES OF THE TARI BASIN AND THEIR POTENTIAL USE BY THE HULI

The following is a list of plant species collected from within the Tari Basin. The list is arranged alphabetically by species. The table also includes information on life form (LF), Huli name, potenial use, specimen collector (Reference), type collection (T) and specimen number (Num. Coll. = numerous collection numbers, x = no specimen number available). The recent introductions are generally given Tok Pisin names and are denoted by “ “.

The life form of the plant is given along with the collector and voucher number in order to give some general indication of the habitat from which the plant was collected. This information however is not exhaustive as the same species may occur in a number of varied habitats and life forms not listed here. The potential use categories are modelled on Powell's review of the ethnobotany for the entire island of New Guinea (Powell, 1976b).

A total of 1181 Huli plant names have been recorded in the basin and are listed in alphabetical order. The list of Huli plant names is a compilation of Hulibi language names. The spelling of the Huli language is not necessarily correct as the names have been recorded directly from the unpublished documents and field records. Most of the names have been recorded from the Hiwanda-Telabo area. Huli varietal names tend to differ throughout the basin and therefore the list should be used with this cautionary note in mind.

TOTAL DATABASE

The taxonomic range of plants collected from the Tari Basin.

	Total Number
Families	157
Genera	516
Species	1162

EDIBLE PLANTS

The taxonomic range of edible plants

	Number	%Total
Families	32	20
Genera	51	10
Species	67	6

MEDICAL PLANTS

The taxonomic range of medical plants

	Number	%Total
Families	11	7
Genera	15	2
Species	21	2

RITUAL PLANTS

The taxonomic range of ritual plants

	Number	%Total
Families	27	17
Genera	36	7
Species	61	5

ECONOMIC PLANTS

The taxonomic range of economic plants

	Number	%Total
Families	58	37
Genera	110	21
Species	238	20

KEY TO SYMBOLS: A key to the structural life form groupings (LF) is given below, adapted from Wood (1984).

Symbol	Structural Life Form Description
G	tall grass, tufts of shoots usually exceeding 25cm in height
g	short grass, shoots usually matted, creeping or otherwise small
s	sedge
H	tall herb (or forb) usually exceeding 20cm in height
h	small herb (or forb) usually less than 10cm in height including matted and creeping herbs
W	arborescent woody plant
w	low woody or semi woody shrub which usually does not exceed 1.5m
f	fern which usually does not exceed 1.5m
v	vine
He	Hepatic
M	Moss

Key to use symbols

c	cultivated
w	wild form used as supplementary food
In.	introduced
Cloth & String	Clothing, string bags and other general use
CW	Wrapping food for cooking
Dress	Dress and body decoration
H Con.	House construction including fence making. This category also includes firewood.
Rope	Rope for construction work
T&W	Tools and weapons

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