Keith Coates Palgrave

TREES

of Southern Africa

NEW EDITION

Revised and updated by

Meg Coates Palgrave

TREES

of Southern Africa

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of Southern Africa

in association with **R.B. Drummond**

Edited by **Dr E.J. Moll**

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Another person whose help has been absolutely invaluable is Marie Jordaan. She has been outstanding, both with her taxonomic suggestions and assistance and also with her friendship and kind hospitality. I am indeed very grateful to her and thank her sincerely.

Editing a book of this nature is an enormous task. Leni Martin has done a brilliant job and I thank her most sincerely for all her suggestions, help and hard work.

I should like to express my appreciation to the team at Struik Publishers: Pippa Parker, who kept faith that this project would reach completion; Helen de Villiers, who undertook the nuts and bolts of producing the book, no small task for a project of this magnitude; Janice Evans, design director; Bev Dodd, who designed and typeset the new edition; Brenda Brickman, who input text corrections on a grand scale; and Katharina von Gerhardt who helped manage the final stages of producing the book. I am delighted with the results.

Finally I should like to pay a special tribute to my late brother-in-law, Keith Coates Palgrave. He wrote this book before the days of the computer – it was originally written by hand, and then typed on an ordinary typewriter, at least twice. The proof reading was undertaken in the old sense of the word: word by word, aloud, with the scientific names being spelt out. He also drafted all the maps himself from herbarium specimens. Throughout the preparation of the book, he was working for the Ministry of Education in Harare, and so all this was done in his spare time. It was a monumental achievement and I am filled with admiration.

Keith had previously collaborated on a book with his family: he wrote the text to accompany paintings done by his mother, Olive Coates Palgrave, in the publication *Trees of Central Africa,* with photographs by Deric and Paul Coates Palgrave, published in 1956. I am privileged to be following in those footsteps.

MEG COATES PALGRAVE
JUNE 2002

INTRODUCTION

This book describes and illustrates the indigenous trees and many of the now naturalised, non-indigenous or alien species that occurr in South Africa, Zimbabwe, Namibia, Botswana, Lesotho, Swaziland and Mozambique, south of the Zambezi River.

'What is a tree?' This is difficult to answer, as a 'tree' is a popular concept and not a scientific entity. A happy definition from Elsie Esterhuysen was that if you could sit in its shade, then it must be a tree. There are obvious 'trees' – tall specimens with one main stem. There are also perennial woody plants, multi-stemmed or low branching, without a main trunk, but which can reach a height of up to 10 metres, which also need to be considered. The approach in this book has been to include as many species as possible in whose shade you could sometimes sit. The intention has been to include a few species that, strictly speaking, should not be here, rather than to omit species that readers would expect to find in the book.

Language has been kept simple, and should be fairly easily understood by all; the use of botanical terms has been kept to a minimum and those that are unavoidable are explained in the illustrated glossary (p. 20) and the glossary of miscellaneous terms (p. 24).

Both flowering and fruiting times are given in the text, but this does not imply that flowers or fruits will always be found throughout these periods, or even at all. It merely indicates that flowering or fruiting has been recorded during those months. These features are very variable, not only with habitat, but also from year to year, from tree to tree, and are also dependent on climatic conditions, rainfall, genetic variation and many other factors. Some trees flower only every two or three years; and a number of species are dioecious with male and female flowers on separate trees so, of course, the male trees do not produce fruit at all.

CLASSIFICATION AND PLANT NAMES

The basic unit of classification in the plant kingdom is the *species*, and no two species are exactly alike. Those that show a marked resemblance to one another are then grouped together into a *genus,* and similar *genera* are then placed together in a *family.*

The names for plants are governed by *The International Rules of Botanical Nomenclature.* This system aims to eliminate any confusion that might arise, and indeed has arisen in the past. If a plant is found to have more than one name, the oldest name is accepted as valid, and this has often resulted in name-changes, which can be confusing but is of importance to the botanist. The name of each species is made up of two parts – the name of the genus to which the plant belongs (rather like a surname) followed by the specific name, which is that of the actual species (the Christian name). For example, four different tree ferns occur in southern Africa, and because they show marked affinities with one another they are all placed in the genus *Cyathea*. Each entity is then given its own specific name, which clearly establishes it as an individual species – the Grassland Tree Fern thus becomes *Cyathea dregei,* and the others *Cyathea capensis*, *Cyathea manniana* and *Cyathea thomsonii*. To complete the picture and also to provide information important to the botanist, the name of the author – the person who first named the plant – is given, although this is frequently abbreviated. Thus the full designation of the Grassland Tree Fern becomes *Cyathea dregei* Kunze. In this case, Kunze described the plant and placed it in the genus *Cyathea*, calling it *Cyathea dregei*. Subsequently, R.M. Tryon decided that this species was better placed in the genus *Alsophila,* and the Grassland Tree Fern became *Alsophila dregei* (Kunze) R.M.Tryon, credit still being given to Kunze by placing his name in brackets. Taxonomists have since decided that *Cyathea* was the correct genus after all, and *Alsophila dregei* (Kunze) R.M.Tryon has become a synonym, a name by which the species has also been known.

In this book, the method of stating the author's name, or their abbreviations, follows *Authors of Plant Names* 1992, edited by R.K. Brummitt & C.E. Powell, published by the Royal Botanic Gardens, Kew, London. In many cases, these will not conform exactly with the citations used in older publications.

The first time a plant is referred to in written text, the entire name is spelt out; but subsequent references to it, or references to other species in the same genus, are usually only given the initial letter of the genus, followed by the specific name in full. Thus *Cyathea dregei* would become *C. dregei*, and *C. capensis* would refer to *Cyathea capensis*.

Within some species there may be further subdivisions into subspecies (subsp.) and/or varieties (var.). Subspecies are populations that show some differences from the original type but are not sufficiently different to justify a new species. Varieties are not as clearly defined as subspecies, nor are they necessarily distinctly separate, either ecologically or geographically, yet they do occur sufficiently frequently to rule out the possibility of their being a chance freak or mutation. Some authors carry the fragmentation of the species even further into forms, but this seems to be of doubtful value.

In instances where subspecies and varieties appear to be totally distinct in the field, they have been treated as separate taxa. Otherwise they are mentioned at the end of the species description, together with their differences, if there is more than one in southern Africa.

SYNONYMS

In some instances, immediately below the name of the tree in the heading, there is another name or names, in italics and appearing in square brackets. This is a synonym – a name that has at some stage applied to this tree, but that has now been superseded. These synonyms have been included to facilitate cross-reference between this book and other publications.

THE ARRANGEMENT USED IN THIS BOOK

When working with thousands of plants, it is obviously highly desirable to have them classified in some or other sequence. Authors have produced various arrangements of the families and genera of plants, placing them in a natural or evolutionary order. Opinions differ as to the most efficient way of ordering plants. Two of the earlier systems of classification that are still widely used are those of Bentham & Hooker, and Engler & Prantl. The *Flora Zambesiaca* follows the order suggested by Bentham & Hooker while the *Flora of Southern Africa* follows that of Engler & Prantl. Work on this problem is ongoing, and many new ideas have been published in recent years. Any arrangement of this kind is primarily a matter of convenience and it is of little account which one is used. As the national herbaria in southern Africa are usually arranged according to the system of Engler & Prantl, it is convenient and logical that this book should follow that system. Within each genus, the species are arranged alphabetically.

ALIEN SPECIES

Alien or non-indigenous species that are known to have become naturalised in one or more areas are mentioned and marked with an asterisk – *. The Plant Protection Research Institute, Pretoria, has recently published *Alien Weeds and Invasive Plants* (2001) by Lesley Henderson. This is a complete guide to the declared weeds and invaders in South Africa, Lesotho and Swaziland. Unfortunately, it does not include Botswana, Mozambique, Namibia and Zimbabwe, and so it is very difficult to get a full picture of their prevalence and distribution throughout southern Africa.

KEYS

Botanical classification is based on the structure of the reproductive organs, i.e. the flowers and fruits, but to use these characters effectively in a key requires both a microscope and detailed botanical knowledge and training.

However, it is often possible to identify trees by their leaves and a combination of other vegetative characteristics such as bark, spines or prickles, a milky or watery sap, hairs, the prominence of the veining; distribution and habitat are also important. All these features have been used in compiling the keys in this book. Also used is reference to the presence or absence of stipules, a feature that might prove difficult to detect. However, stipules are always either absent or present (sometimes only as stipular scars), unlike flowers and fruit which, among other factors, are dependent on the time of year. Stipules often fall early, so it is necessary to examine young and new growth. The keys follow a series of questions, each with two options, **a** or **b**, which, if answered correctly, should lead to the identification of the tree.

It must be taken into account that trees, like people, are very variable, and so it is not always possible to categorise them exactly. Nevertheless, an attempt has been made to present the keys in

a user-friendly format that should enable readers to identify trees. Mention of the flowers and fruits has been included for confirmation purposes only. Remember that fruits often remain on the tree for a while, and their remains can sometimes be found on the ground.

In order to detect minute details, the use of a 10x lens can prove useful. For those without such a lens, reversing the binoculars and looking through the 'wrong end' has the effect of magnifying close objects – although they do have to be quite close. The upper lip or tongue are much more sensitive than the finger, and it is surprising how many leaves thought to be hairless prove to be hairy or velvety after they have been tested with the tongue.

DISTRIBUTION MAPS

The indigenous species entries are accompanied by distribution maps. The black area serves as a rough guide to the area in which the species is likely to be found. It does not indicate whether a species is evenly spread or occurs in only isolated localities. Two types of arrow are used: long thin arrows pinpoint small localities of distribution that might otherwise go unnoticed. Short squat arrows pointing north indicate species that are also known to occur north of the Zambezi-Cunene line; a map without such an arrow indicates that the species is endemic, i.e. restricted to the area covered by this book.

ILLUSTRATIONS

(a) The leaf drawings

Leaf drawings accompanying each species account show the leaf in outline, the petiole, and how this joins the stem; the most important features are the general shape, the apex, base, margin and venation. The drawings are not to scale. Little would be accomplished by including scales, either figuratively or graphically, as these are always difficult to interpret and leaves often vary tremendously in size. However, the description is always close to the drawing and quick reference to the text will give the exact size of the leaves and range of difference. It can be appreciated that in an area as vast and diverse as that covered by this book, variations within even a single species can be considerable. In preparing the leaf drawings, care was taken to select a good average leaf with characteristics that occurred most frequently over its range. Occasionally there is more than one leaf to depict the variation.

(b) Photographs

The composite colour photographs appearing in the colour-plate section give a valuable field impression of the tree, with close-up detail provided by natural material – a process devised specifically for this work. There are also close-up illustrations of flowers or fruits.

TREE NUMBERS

Numbers derived from the *Pocket List of Southern African Indigenous Trees* (Briza, 2002) and the *Zimbabwe National Tree List* have been given for each species appearing on those lists. If a species does not occur in one of the countries, reference to the number has been omitted; if a species does occur but has not been given a number on either one or the other, or both, of the lists, then a blank has been left. Should a number be allocated in the future, the reader will be able to insert it.

COMMON NAMES

If a tree has a name, it has an identity. The problem is that different people might often know the same tree by different common names, making communication about that species difficult. Botanical names are unique: no two are ever the same. However, being Latin, they are often difficult to grasp and remember, and so common names have been included; each species has an English name, and for those from South Africa, an Afrikaans name too. There is simply not enough space to include more than one name, not even as a synonym in the index. For the same reason, it was decided to omit all African vernacular names. Over the area covered by this book, the number of languages and dialects is so vast that the list of names would become unmanageable. There have been a number of initiatives, of which I have been very much a part, to upgrade the English common names and bring them more into line with modern South Africa. I believe that those chosen for this book are useful, helpful and easy to pronounce and remember. If anyone knows a tree by a different name, it is not suggested that they must stop using that one and use the name in the book; these names are provided for those starting to get to know trees. Many of the names are hyphenated, making them a single entity; for instance, the name White-stinkwood makes it clear that 'white' is no incidental adjective, but a permanent element of the name; similarly Thorny-elm, Wild-almond, Cluster-pear, Shakama-plum, Hook-berry etc.

MEDICINAL AND POISONOUS USES OF TREES

The various medical uses of trees described in this book have been culled from many sources; it must be emphasised that no claims are made as to their efficacy. There is no doubt that some of these substances are very harmful and idle experimentation could prove dangerous.

CONSERVATION AND PROTECTION

Most of the countries in southern Africa have legislated against the indiscriminate removal or destruction of the natural flora, and permits are required from the Department of Nature Conservation to collect plants. Control and the conservation status of plants is now in the hands of the Provincial

Authorities in South Africa, and so there is no national list of protected species. Red Data Lists are currently being prepared for all the areas and this will provide a list of species considered to be threatened with extinction and can also be used as a tool to help in the preservation of southern Africa's rich floral diversity.

HOW TO USE THIS BOOK

This entire book is essentially a key to the trees of southern Africa, for every part of it contributes towards the identification of our trees: the text, distribution maps, line drawings, illustrations and colour photographs are all valuable aids to identifying trees.

The introductory key on pages 26 to 71 provides a guide to the tree families. The key presents a series of questions, each with two options, either **a** or **b**, which, if answered correctly, should lead to the identification of the family. Some families are readily recognisable, while others are somewhat more difficult to distinguish. In these cases, it has been necessary to include them in the key several times.

Once the family has been determined, a key to the genera can be found under each family, and under each genus there is yet a further key the actual species. All the keys are based on leaves in the first instance and so it is important to be able to identify exactly what a leaf is. For those not familiar with botanical terms, a glossary appears on page 20, and here are some guidelines to key terms:

A **leaf** grows on a **stem** (or stalk, twig, branch or branchlet).

There is a **growing tip** at the end of a stem. There is no growing tip at the end of a leaf.

There is a **bud** in the **axil** between the leaf and the stem. There is no bud between the **leaflet** and the **rachis**.

The growing tip and the **axillary bud** can sometimes be difficult to see. The axillary bud is a **growing bud**, and if the growing tip at the end of the stem is damaged or broken off, the stem can grow from the axillary bud.

A **simple leaf** has the blade in one piece; a **compound leaf** has the blade cut up into pieces.

There are only seven types of leaves: one simple and six compound. Of the compound leaves there are three **pinnate** (like a feather) and three **not pinnate**. **Once-pinnate** leaves have leaflets arranged along a central stalk like a feather, and are either **imparipinnate** with a single leaflet at the end or **paripinnate** with a pair of leaflets at the end; **bipinnate** leaves with the first division of a pinnate leaf are cut up again, with leaflets borne on branches on the rachis, looking like feathers on a feather.

Compound leaves that are not pinnate have leaflets, or **leaflet stalks**, all arising from the same point; **bifoliolate** leaves have two leaflets; **trifoliolate** leaves have three leaflets; and **digitate** (or **palmate**) have four or more leaflets (like fingers on a hand).

There are only five ways in which the leaves are arranged on the stem: **fascicled**, **spiralled**, **alternate**, **opposite** and **whorled**.

Armed with these definitions, identifying trees using the keys should not be too difficult a task.

Let's work through an example – the Sickle-bush, ***Dichrostachys cinerea***:
On page 26:
Plants without a particularly distinctive growth form
(Are the) leaves simple?
(Are the) leaves compound?
The answer is **B**, compound

(1) (Are the) leaves pinnate?
(2) (Are the) leaves not pinnate?
The answer is (1) – pinnate ..... go to page 66

(1a) (Are the) leaves once-pinnate? **2**
(b) (Are the) leaves bipinnate? **4**
The answer is **(b),** so go to 4.

4. **a.** (Are the) leaves alternate or spirally arranged? **5**
b. (Are the) leaves opposite?..... **Bignoniaceae** (p. 1006)
The answer is **a**, so go to **5**.

5. **a.** (Are the) leaves with or without glands, position variable; fruit fleshy or a 2-sided pod? ***6***
b. (Are the) leaves with glands at the base of the petiole and the pinnae; fruit a pod-like capsule, 3-sided, splitting into 3 valves?..... **Moringaceae** (p. 237)
The answer is **a**, so go to ***6***.

6. **a.** (Are the) leaves without 1 leaflet conspicuously right at the junction of the pinna and the rachis? ..... **Fabaceae** (p. 253)
b. (Are the) leaves frequently with 1 leaflet conspicuously placed right at the junction of the pinna and the rachis; occurring only in central Mozambique and northwards? ..... **Sapindaceae** (p. 638)
The answer is **a**, so go to **Fabaceae** on page 253.

From there, follow the family key:
1. **a.** (Are the) leaves compound, bipinnate? **2**
b. (Are the) compound leaves absent, except in seedlings or in very young shoots, their place being taken by phyllodes, or flattened stems which closely resemble simple leaves? ..... **3. *Acacia**
The answer is **a**, so go to **2**.

2. **a.** (Are the) plants armed with spines or prickles (thorns)? **3**
b. (Are the) plants unarmed?..... **10**
The answer is **a**, so go to **3**.

3. **a.** (Are the) prickles or spines in pairs?..... **4**
b. (Are the) prickles or spines not in pairs? ***6***
The answer is **b**, so go to ***6***.

6. **a.** (Are the) plants armed with hooked prickles?..... **8**
b. (Are the) plants with straight, spine-tipped branchlets?..... **7**
The answer is **b**, so go to **7**.

7. **a.** (Are the) leaves with more than 4 pairs of pinnae and many small leaflets; rachis with a stalked gland, rather like a bee's sting, between some pairs of pinnae; petiole without glands; flowers conspicuously 2-coloured, the lower portion pink (sterile), the upper portion yellow (fertile) pods in contorted clusters, indehiscent? ..... ***6.* Dichrostachys**
b. (Are the) leaves with 2–4 pairs of pinnae, each with 2–4 pairs of leaflets; petiole with a round gland; flowers creamy white in half-spherical heads; fruit a single flat pod, dehiscent?..... **1. Albizia**
The answer is **a**, so go to ***6***, Dichrostachys, (which is the sixth genus) and check against the relevant drawings, map and descriptions for final identification of the species.

There will inevitably be difficulties with keying out certain species, for many are extremely difficult to identify except under a microscope. When unable to identify a tree, try your local herbarium for help with identification. The addresses of these herbaria are given on page 18.

LIST OF SOME HERBARIA

Botswana
National Herbarium, National Museum, Monuments & Art Gallery, Private Bag 00114, Gaborone
Herbarium, Department of Agricultural Research, University of Botswana, Private Bag 0033, Gaborone
Herbarium, Department of Biological Sciences, University of Botswana, Private Bag 0022, Gaborone

Lesotho
Herbarium, Department of Biology, National University of Lesotho, PO Box Roma 180

Mozambique
Herbário, Departmento de Botánica, Universidade, Eduardo Mondlane, Caixa Postal 257, Maputo
LMA Herbário, Departmento de Botanica, Instituto Naçional de Investigâo Agronomia, F.P.L.M. Caixa Postal 3658, Maputo

Namibia
National Herbarium of Namibia, National Botanical Research Institute, Private Bag 13184, Windhoek

South Africa
Bews Herbarium, University of Natal, Private Bag X 01, Scottsville, 3209
Bolus Herbarium, University of Cape Town, Private Bag, Rondebosch, Cape, 7701
C.E. Moss Herbarium, University of the Witwatersrand, Private Bag 3, Wits, 2050
Compton Herbarium, Kirstenbosch, Private Bag X7, Claremont, Cape, 7735
G.H.W.J. Schweickerdt Herbarium, University of Pretoria, Pretoria, 0002
Herbarium, University of the North, Private Bag X 1106, Sovenga, 0727
Herbarium, University of Transkei, Private Bag X1 Unitra, 5117
McGregor Museum Herbarium Kimberley, PO Box 316, Kimberley, 8300
Natal Herbarium, Botanic Gardens Road, Durban, 4001
National Botanical Institute, Private Bag X101, Pretoria, 0001
National Museum Herbarium, PO Box 266, Bloemfontein, 9300
Ria Olivier Herbarium, University of Port Elizabeth, PO Box 1600, Port Elizabeth, 6000
Selma Schonland Herbarium, Albany Museum, PO Box 101, Grahamstown, 6140
Southern Cape Herbarium, PO Box 564, George, 6530

Swaziland
National Herbarium of Swaziland, PO Box 4, Malkerns

Zimbabwe
National Herbarium & Botanic Garden, PO Box CY 550, Causeway, Harare

SOCIETIES
Botanical Society of South Africa, Kirstenbosch, Claremont, 7735, South Africa
Dendrological Society, PO Box 104, Pretoria, 0001, South Africa
Plantlife, PO Box 111, Port Edward, 4295, South Africa
The Tree Society of Southern Africa, PO Box 70720, Bryanston, 2021, South Africa
Tree Society of Zimbabwe, PO Box 2128, Harare, Zimbabwe

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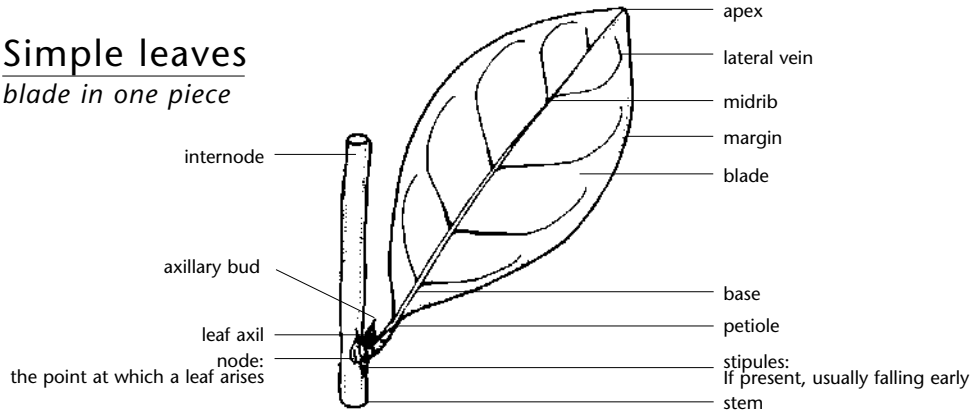
GLOSSARY

A. LEAVES

Simple leaves

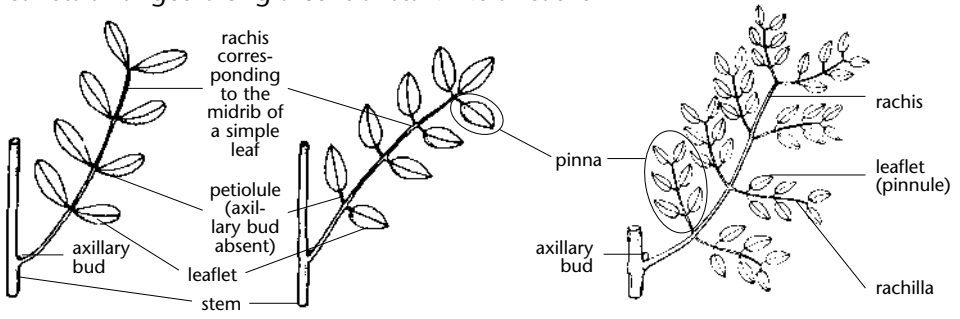
blade in one piece



Compound leaves

blade cut up into pieces

Pinnate
leaflets arranged along a central stalk like a feather



PARIPINNATE
ends in a pair of leaflets

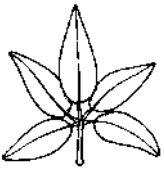
IMPARIPINNATE
ends in a single leaflet

BIPINNATE
cut up twice, looking like feathers on a feather

Not pinnate
leaflets all arising from the same point.

BIFOLIOLATE
with 2 leaflets

TRIFOLIOLATE
with 3 leaflets

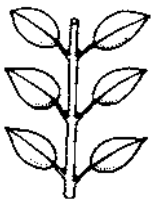


PALMATE OR DIGITATE
with 4 or more leaflets
(like fingers on a hand)

Arrangement of leaves

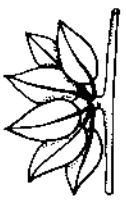
ALTERNATE
on opposite sides of the stem (distichous)

SPIRALLED
around the stem, one leaf at a time

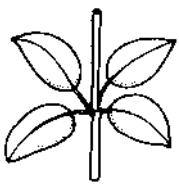


OPPOSITE
in pairs on opposite sides of the stem

SUB-OPPOSITE
almost opposite, but not quite



FASCICLED OR CLUSTERED
all rising together from almost the same point



WHORLED
3 or more going around the stem at the same point

Shape of leaves and leaflets

ELLIPTIC
widest about the middle

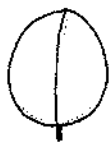
OVATE
widest below the middle

OBOVATE
widest above the middle

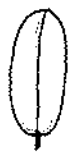
LINEAR
long and narrow

LANCEOLATE
long and narrow

OBLANCEOLATE
long and narrow



ROUND
almost as wide as long



OBLONG
with more or less parallel sides

Apex

ROUNDED

NOTCHED

TAPERING
(acute)
tapering gradually

ATTENUATE
(acuminate)
drawn out into a long point

SQUARE
(truncate)

HAIR-LIKE TIP
(mucronate)
or bristle-tipped if hard (aristate)

Base

ROUNDED

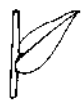
TAPERING
(cuneate)

SQUARE
(truncate)

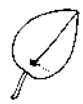
LOBED
(cordate)

ASYMMETRIC
(oblique or lobsided)

DECURRENT

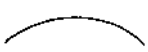


SESSILE
(without a petiole)

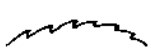


PELTATE

Margin



ENTIRE



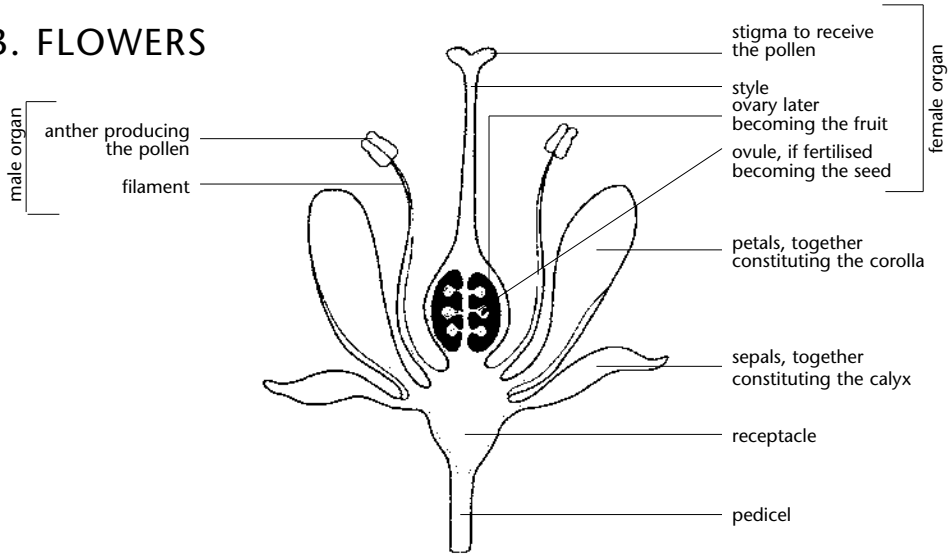
TOOTHED
(serrate)

COARSELY TOOTHED
(dentate)

SCALLOPED
(crenate or finely so = crenulate)

PALMATELY LOBED

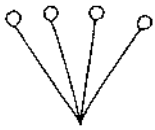
B. FLOWERS



Inflorescence

A group of flowers together forming a definite structure

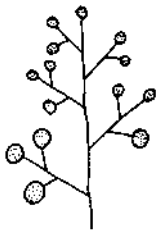
Types of inflorescence



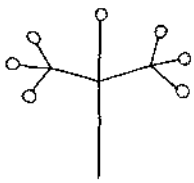
FASCICLE OR CLUSTER

SPIKE

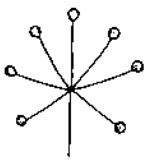
RACEME



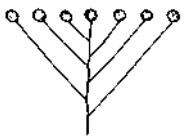
PANICLE



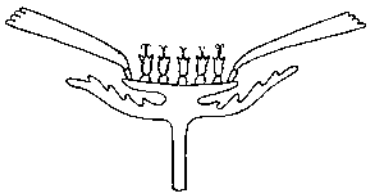
CYME
(the branches forked or opposite, the centre flower opens first)



UMBEL

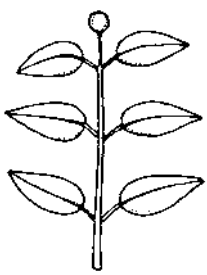


CORYMB

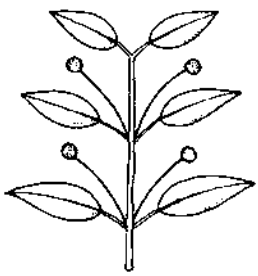


CAPITULUM – DAISY TYPE
the thistle-type is narrow and lacks the petalloid ray-florets; characteristic of the Asteraceae

Arrangement of flowers and inflorescences



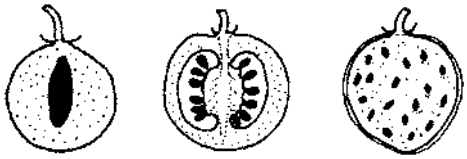
TERMINAL
at the end of a stem



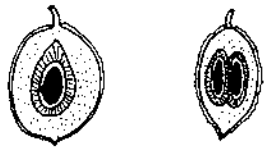
AXILLARY
in the axils of the leaves

C. FRUITS

Fleshy fruits



BERRY
1–many seeds
without a hard layer



DRUPE
1–many seeds surrounded
by a stony layer

Dry fruits

Not dehiscent

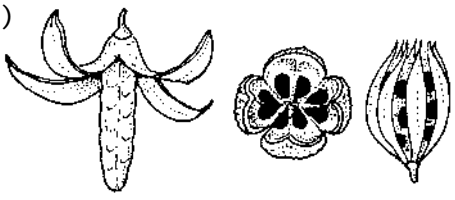
ACHENE
Small,
single-seeded

SAMARA
Winged achene

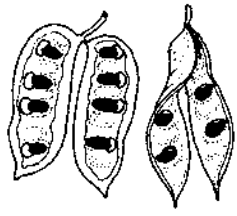
NUT
Single seeded, with
woody outer layer

Dehiscent
(splitting open)

FOLLICLE
Splits on one side

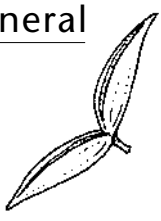


CAPSULE
Splits into several valves



LEGUME
Splits into 2 valves

General



**FRUIT WITH 2
MERICARPS**

**FRUIT WITH MANY
MONOCARPS**

Monocarps and mericarps
originate from a single flower

FRUIT SYNCARPOUS
Originate from many
flowers close together

Shapes

ELLIPSOID

OVOID

OBOVOID

ROUND

CYLINDRICAL

D. MISCELLANEOUS TERMS

alien: a plant introduced from elsewhere and now more or less naturalised.

androgynophore: a stalk carrying both the stamens and the ovary.

androphore: a stalk carrying the stamens.

appressed: lying close to and flat along the surface.

aril: an additional covering on some seeds; often brightly coloured; arising from the seed stalk.

arillode and **pseudo-aril:** as for 'aril' above but arising from another part of the seed, not the stalk.

axil: the upper angle between a leaf and the stem on which it is borne; the upper angle between the lateral veins and the midrib.

axillary bud: in the axil between the leaf and the stem; a growing bud; if the growing tip is destroyed a new stem can grow from the axillary bud; a stem cannot grow from a leaf, therefore there are no axillary buds, or growing tips on a compound leaf.

bacterial nodule: a swelling or knob containing bacteria.

blade: the flat expanded part of the leaf (=lamina).

base: of a leaf or leaflet (bottom part of the leaf nearest the petiole); symmetric (the same on both sides) or asymmetric (lopsided, or uneven); to check fold the leaf in half, if the two sides are more or less the same, the base is symmetric, if they are uneven it is asymmetric.

bract: a small often modified leaf with a flower or inflorescence in its axil.

carpels: one of the sections of an ovary, usually joined together; sometimes the carpels are separate, and one such separate section when developed into the fruit is termed a mericarp.

chamber: the cavity of an ovary which contains the ovules (= locules).

ciliate: with hair-like outgrowths.

coppice: vegetative shoots at the base of the stem; sprouts arising from a stump.

crisped: curled, wavy or crinkled.

cyathium: the peculiar inflorescence found in the genus *Euphorbia* having a cup-shaped involucre with stamens and stalked ovary, each stamen and the ovary being a separate flower.

decurrent: when the edges of the base of the leaf run down the petiole, often as narrow wings, more or less obscuring it.

deciduous: leaves falling at the end of the growing season.

decussate: in opposite pairs, one pair at right angles to the next.

dehiscent: opening spontaneously when ripe.

dichotomous: branched or forked in two almost equal divisions.

dioecious: unisexual flowers with male and female flowers on separate plants.

disc: an enlargement of the receptacle inside the flower, usually in the form of a ring, cup or cushion, often lobed or with glands (nectaries).

distal: right at the end, furthest away from the centre; leaves at the ends of the branches or leaflets at the end of the rachis (opposite of proximal).

domatia: small structures in the axil of the main lateral veins and the midrib; either conspicuous tufts of hairs or small pits or both; formed by the plant to act as shelter for mites who in return help clean the leaf surface and protect it against plant-eating mites; acarodomatia are houses for mites and myrmecodomatia are houses for ants.

drip-tip: apex tapering to a long point (=attenuate).

dwala: a flat, sloping sheet of granite.

evergreen: retaining green leaves throughout the year.

extra-floral nectaries: nectar secreting glands outside the flower.

fynbos: low-growing, woody scrub community made up of plants mostly small-leaved and drought resistant; characteristic of the Western Cape.

galls: abnormal outgrowths on plants caused by fungi, mites and insects, especially *Cynipidae*, (gall wasps) and *Cecidopmyiidae*, (one of the families of flies); eggs are laid in the plant (probably with a growth hormone) which reacts by developing an abnormal growth around the egg; this provides food for the larva which develops inside; often these creatures are host specific and so the presence of their gall helps to identify the plant.

glands: secreting organs producing oil, resin, nectar, water etc; those on trees normally produce nectar, being outside the flower are termed extra-floral nectaries; they occur on the surface, embedded in the surface, raised on small stalks, looking like bee stings, warty protuberances, or fleshy abnormal outgrowths.

gland dots: translucent dots seen when a leaf is against a strong light; they often contain citrus oils.

glandular hairs: hairs with minute glands on the end, often sticky to the touch.

gynophore: a stalk carrying the female parts of the flower.

hispid: with stiff hairs or bristles.

hypanthium: a cup or tube bearing floral parts above the base and often above the top of the ovary of a flower.

hypocotyl: in a plant embryo or very young seedling, that portion of the stem below the first or food leaves, or cotyledon.

indehiscent: not opening when ripe.

interpetiolar: extending across the stem between the petioles of opposite leaves.

involucre: bracts forming a whorl or whorls and produced at the base of, or below, a very compact or condensed flowerhead.

jesse bush: thick bush or dry layered forest, often on Kalahari sand particularly in the Zambezi Valley.

lateral: borne on or at the side.

leaflet: the ultimate part of a compound leaf, or the individual unit of a compound leaf.

lenticels: corky breathing spots on the bark of the stem, branches and roots.

medusoid: a head of snake-like structures, or branches.

miombo woodland: woodland dominated by *Brachystegia* and *Julbernardia*, common on acid, usually shallow soils in Zimbabwe, Mozambique and further north.

mericarp: one segment of a fruit that breaks at maturity into units derived from individual carpels.

mesophyte: plants thriving in a normal temperate climate, avoiding both very wet and very dry conditions.

monoecious: unisexual flowers with male and female flowers on the same plants.

naturalised: a plant introduced from elsewhere which has become established and is reproducing successfully.

nectary: a gland usually in flowers, producing nectar.

net-veining: the smaller veins which are joined together like the mesh of a net.

node: the point on the stem at which the leaf or leaves arise.

notched: with a small V-shaped indentation at the apex.

obconical: shaped like an inverted cone.

ostiole: an opening or pore e.g. at the end of a fig.

pappus: a circle or tuft of bristles or hairs on the apex of a fruit (especially on the small fruits, or nutlets, in *Asteraceae*).

peltate: a leaf with the petiole joined on the undersurface, instead of at the edge; e.g. nasturtiums and pelagoniums.

perianth: the outer sterile whorl of a flower; the sepals and petals fused together.

petiole: leaf-stalk, the stalk that joins the leaf to the stem (stalk, twig, or branchlet).

pioneer: the first plants which colonise bare or disturbed areas.

pneumatophores: the 'breathing roots' produced by constituents of mangrove swamp forests.

pulvinus: a swelling on the petiole or petiolule, usually at the base, sometimes just below the blade of the leaf/leaflet; may help orientate the leaf/leaflet.

pinna: (plural **pinnae**) from the Latin '*pinna*' feather and is the first division of a pinnate leaf and also the leaflet of a once-pinnate leaf.

prickles: sharp outgrowths from the bark and coming off with the bark, like rose prickles.

proximal: towards the centre; i.e. leaves away from the ends of the branches and further towards the centre of the plant (opposite of distal).

pulvinus: a swelling at the junction of the petiole and the stem or at the junction of the petiolule and the rachis which probably controls the orientation of the leaf or leaflet.

rachis (also spelt rhachis) means ridge, spine, or backbone; the central axis along which the leaflets of a pinnate leaf are arranged.

resin: an inflammable adhesive, insoluble in water, secreted by some plants.

sagittate: shaped like an arrow-head with two backward directed barbs or lobes.

sap: to check for milky or yellow sap, pick a leaf, look at the broken end that you have just picked, look at where you have picked it from and fold the leaf across, in half, and break it.

scabrid: rough to the touch, usually due to the presence of fine rough hairs.

scandent: tending to clamber or climb by means of tendrils.

sessile: without a stalk (petiole, pedicel or peduncle).

sinuate: uneven with rather deep indentations or small lobes.

spines: sharp-pointed, hardened structures modified from another organ; e.g. branchlets, stipules, leaves, etc.

spinescent: ending in a spine or in a very hard sharp point.

stellate: star-shaped; hairs in little clumps radiating horizontally in all directions.

stipe: the stalk supporting the carpel or gynoecium; stem or caudex of palms and tree-ferns.

stipules: usually leafy, or scale-like, at the base of the petiole, i.e. where the petiole joins the stem; they probably protect the leaf while it is still a bud; sometimes persistent remaining to maturity, instead of falling 'early', or in the normal manner.

staminodes: sterile or abortive stamens.

stipels: two small stipule-like outgrowths from the base of the leaflets of a compound leaf.

stone: the hard seed-containing pip of a drupe; e.g. in a cherry, peach or olive.

sub-marginal vein: a vein that goes from the base to the apex just inside the margin.

subtend: below and close to, e.g. a bract often subtends a flower.

suffrutex: a shrub, or shrublet, usually producing leafy and flowering shoots each year from a perennial underground woody rootstock.

taxon: (plural **taxa**) a group or category, at any level, in a system for classifying living organisms, e.g. family, genus, species, or subspecies.

tepals: any of the members of the perianth that is not clearly differentiated into calyx and corolla.

tessellate: markings or colours arranged in squares.

thecae: the pollen-producing bodies in the anther of a stamen.

thyrse: a mixed inflorescence with the main axis a raceme and later axes in the form of cymes.

unarmed: lacking thorns or spines or prickles.

undulate: with a wavy margin.

wavy: describes the margin of leaves that are not flat, go up and down as opposed to sinuate when the margin goes in and out.

whale-backs: great dome-shaped masses of solid granite, forming hills.

xerophytes: plants specially adapted to growing under desert conditions or conditions with very little available water.

KEY TO FAMILIES

PLANTS THAT ARE DISTINCTIVE AND EASILY RECOGNISED BY THEIR CHARACTER AND HABIT

A Trunk unbranched or sparingly branched; leaves large, usually in terminal clusters ..... go to page 28

B Plants succulent, with fleshy stems, leaves or above-ground tubers ..... go to page 30

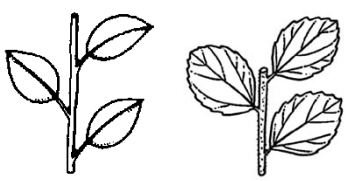
C Plants with very small, narrow, scale-like or needle-like leaves ..... go to page 33

PLANTS WITHOUT A PARTICULARLY DISTINCTIVE GROWTH FORM

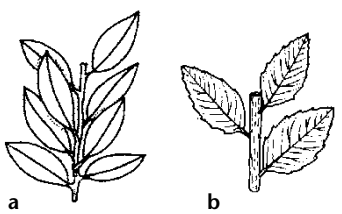
A Leaves simple

(1) leaves fascicled on short dwarf spur-branchlets, or crowded at the ends of the branches;
margin entire or margin not entire ..... go to page 35

(2) leaves alternate (distichous) in 2 rows alternately on opposite sides of the stem;
margin entire or margin not entire ..... go to page 40

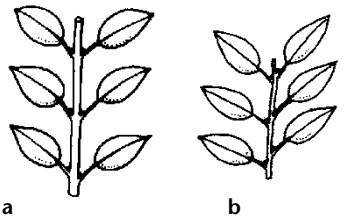


(3) leaves spirally arranged
a. margin entire ..... go to page 42
b. margin not entire ..... go to page 51



(4) leaves opposite or sub-opposite

a. margin entire ..... go to page 56



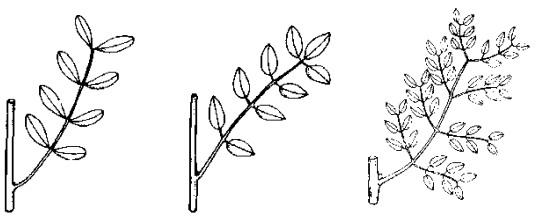
a **b**

b. margin not entire ..... go to page 62

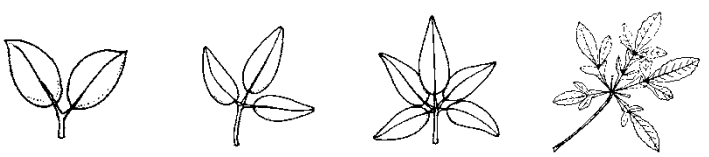
(5) leaves whorled (go around the stem all in the same place)
margin entire or margin not entire ..... go to page 64

B Leaves compound

(1) leaves pinnate ..... go to page 66



(2) leaves not pinnate (bifoliolate, trifoliolate or digitate) ..... go to page 69



PLANTS THAT ARE DISTINCTIVE AND EASILY RECOGNISED BY THEIR CHARACTER AND HABIT

A Trunk unbranched or sparingly branched; leaves large, usually in terminal clusters

1. **a.** Mature plants with more than 2 leaves **2**
b. Welwitschia; a strange desert plant occurring along the coastal strip north to Walvis Bay in Namibia; with a dwarf massive stem usually less than 1 m high and 2 opposite persistent leaves which are up to 2 m long, split and torn by the wind to form a tangled mass ..... **Welwitschiaceae** (p. 93)

2. **a.** Growth-form not grass-like **3**
b. Bamboos; stems hard, shiny, leaves grass-like ..... **Poaceae** (p. 94)

3. **a.** Trees not banana-like; trunk hard; stems usually unbranched or sparingly branched, leaves large and mostly in a distinct crown at the top of the stems **5**
b. Trees banana-like, trunk soft, leaves very large, usually more than 20 cm, wides often ragged and wind-torn **4**

4. **a.** Ensete; leaves with petiole short or almost absent, midrib pink ..... **Musaceae** (p. 117)

b. Strelitzia; leaves with petiole up to 2 m long; midrib pale yellowish green ..... **Strelitziaceae** (p. 118)

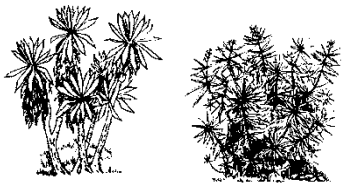
5. **a.** Leaves simple **6**
b. Leaves compound **8**

6. **a.** Plants with stems and/or leaves distinctly succulent ..... go to page 30
b. Plants not succulent **7**

7. **a.** Leaves very small, scale- or needle-like ..... go to page 33
b. Leaves somewhat strap-like, thin or leathery but not fleshy; trunk woody **9**

8. **a.** Leaves pinnate **10**
b. Leaves palmate or palmately lobed **12**

9. **a.** Draceana; leaves in terminal rosettes, margin without prickles ..... **Dracaenaceae** (p. 115)



b. Pandanus; leaves with prickles on the margin; stem raised above the ground on numerous sturdy stilt roots ..... **Pandanaceae** (p. 96)

10. **a.** Leaves once-pinnate **11**
b. Tree-ferns; leaves (fronds) tri-pinnate; fronds expanding like an uncoiling spring; spores produced in sori, positioned along the veins on the undersurface of the leaflets .... **Cyatheaceae** (p. 72)

11. **a.** Cycads; leaves hard, rigid, leathery; leaflets distinctly spine-tipped, with numerous parallel veins but without a distinct midrib, margin entire or spine-tipped, sometimes the lowermost leaflets reduced to a series of spines; bearing 1–5 cones, sometimes more, on or around the stem apex; male cones usually smaller than female cones ..... **Cycadaceae** (p. 74) ..... **Zamiaceae** (p. 74)

b. Palms; leaves graceful, leathery but pliable; leaflets slightly spine-tipped, folded along the prominent midrib; bearing flowers which develop into fruit ..... **Arecaceae** (p. 97)

12. a. Palms; leaves graceful, fan-shaped, grey-green, 1,5–2 m long including the petiole which is armed with sharp recurved spines ..... **Arecaceae** (p. 97)

b. Trees; leaves mono-digitate, bi-digitate (leaflets completely divided to the midrib once) or multi-digitate (secondary leaflets divided into tertiary leaflets along a central axis, sometimes with lateral leaflets arising at the points of articulation) ..... **Araliaceae** (p. 844)

B Plants succulent, with fleshy stems, leaves or above ground tubers

1. a. Plants with leaves even if only for part of the year **2**
b. Leaves absent, or rudimentary and falling very early, branchlets green; plants succulent, cactus-like; fruit a 3-lobed dehiscent capsule 8

2. a. Leaves simple **4**
b. Leaves compound **3**

3. a. Leaves trifoliolate or digitate **9**
b. Leaves pinnate **10**

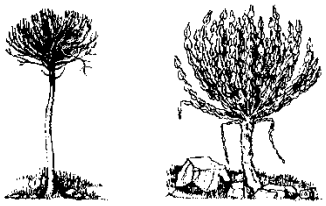
4. a. Not aloes **5**
b. Aloes; stems unbranched, wholly or partly covered with old dry leaves, occasionally branched; leaves long, narrow, fleshy, forming a closely packed head at the apex of the stems or branches; margin with or without teeth, veining parallel; with characteristic aloe flowers .... **Aloaceae** (p. 102)

5. a. Plants unarmed; thickset succulent shrubs or small trees **6**
b. Plants armed with spines **11**

6. a. Leaves spirally arranged or clustered on dwarf spur-branchlets **7**
b. Leaves opposite **13**

7. **a.** Plants without a milky or watery sap **16**
b. Plants with a milky or watery sap, sometimes poisonous **15**

8. **a.** Armed with spines; plants single-stemmed and candelabra-shaped or fleshy; branchlets green square or winged, with spines ..... **Euphorbiaceae** (p. 460)



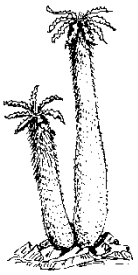
b. Unarmed; plants many-branched; branchlets narrowly cylindrical, up to 7 mm in diameter, green, forming brush-like masses ..... **Euphorbiaceae** (p. 460)

9. **a.** Leaves usually with 3 leaflets (sometimes up to 9); thickset, succulent trees, bark pale with a papery peel; fruit fleshy; occurring in dry, stony areas, and on rocky hillsides in Namibia .... **Vitaceae** (p. 676)
b. Leaves digitate usually with 5 leaflets (sometimes 3–9); grotesquely fat trees; bark pinkish grey, reddish brown or coppery, smooth, heavily folded; fruit with a hard, woody shell, covered with yellowish grey velvety hairs and a floury, acid pulp, indehiscent .....**Bombacaceae** (p. 705)

10. **a.** Leaves once-pinnate; bark smooth or papery; with a watery or resinous, often aromatic sap ..... **Burseraceae** (p. 425)
b. Leaves bipinnate, large; bark smooth, pale whitish grey to almost coppery and shiny; fruit a pod-like capsule, 3-sided, splitting into 3 valves ..... **Moringaceae** (p. 237)

11. **a.** Plants with a sticky, milky or watery sap **12**
b. Plants without a milky or watery sap; trunk smooth, swollen at the base and giving rise to numerous erect stiff grey branches; armed with spreading spines, leaves fascicled on dwarf spur-branchlets, often no more than cushions in the axils of the spines; leaves simple, deciduous; fruit a capsule elliptic to oblong or ovate, compressed, rigid, dehiscent .... **Pedaliaceae** (p. 1014)

12. a. Plants with succulent stems, rather bottle-shaped and tapering to the apex, with a few upright branches near the top or unbranched and cylindrical but occasionally branched from near the base, also with a few short branches near the apex, with rigid spines that are modified stipules; fruit paired follicles ..... **Apocynaceae** (p. 941)



b. Plants with bark smooth or papery; branchlets spine-tipped; fruit thinly fleshy, when mature splitting into 2 sections which fall away to reveal a single black stone, frequently with a pseudo-aril, often brightly coloured, clasping the base ..... **Burseraceae** (p. 425)

13. a. Branchlets without 3 distinct pairs of decussate leaves **14**
b. Branchlets each with 3 pairs of decussate leaves, the oldest pair falling off successively, resulting in a conspicuous dry leaf litter below the plant; fruit a very small capsule..... ..... **Mesembryanthemaceae** (p. 200)

14. a. Bark green when young, becoming red-brown to slate-grey, and smooth with conspicuous leaf scars; fruit a small 3-winged capsule hanging on a thin, short stalk .... **Portulacaceae** (p. 201)
b. Trunk with conspicuous leaf-scars around the stem; leaves thick, fleshy, grey-green, with or without a waxy bloom; margin entire, often horny and reddish-rimmed; fruit 3–5 separate follicles ..... **Crassulaceae** (p. 238)

15. a. Plants with a watery sap; leaves hairless, midrib often with a pink tinge; anthers with a long, hairy appendage; fruit paired follicles ..... **Apocynaceae** (p. 941)

b. Plants with a milky sap (poisonous); stems and leaves fleshy; midrib prominent and tinged with purple or red; leaves often crowded at the ends of the succulent-looking branches; deciduous leaving conspicuous leaf-scars; fruit a small dehiscent capsule..... **Euphorbiaceae** (p. 460)

16. a. Leaves not lobed **17**
b. Leaves shallowly lobed to so deeply divided that they appear digitate, often with glands on the petiole or blade; trunk thickset, tapering into the branches; branches long, whip-like, drooping, red-brown, with a tendency to clamber; fruit a 3-valved capsule .... **Passifloraceae** (p. 768)

17. a. Leaves very small no more than 5 mm long **18**
b. Leaves longer than 5 cm; bark olive-green, peeling in thin, yellow, papery sheets; branches short, with conspicuous scars left by the fallen leaves ..... **Crassulaceae** (p. 238)

18. a. Leaves small, fat, scale-like, about 2 mm long and as broad, tightly packed along the branchlets; fruit flower-like enclosed in the persistent perianth which develops large petal-like wings ..... **Chenopodiaceae** (p. 198)
b. Leaves about twice as long as broad, clustered on black raised protuberances conspicuously dotted on the smooth silver-grey bark, branches almost creamy-white .... **Portulacaceae** (p. 201)

C Plants with very small, narrow, scale-like or needle-like leaves

1. **a.** Leaves present, small, needle-like or scale-like **5**
b. Mature leaves usually absent except during the most active growing period when leaves are present on the young growing shoots **2**

2. **a.** Leaves simple **4**
b. Leaves compound **3**

3. **a.** Leaves 2- to 5-pinnate stiff, green or grey-green, leaf-like to needle-like or sometimes reduced to the petiole and/or rachis, which are sometimes simple, long, similar to a pine-needle, divided into sections or undivided, lower young leaves flattened, very different from the upper leaves; fruit with mericarps equal, unwinged ..... **Apiaceae** (p. 852)
b. Leaves bipinnate but usually absent, the dark green rachis hanging down like a midrib stripped of its surrounding leaf; the tiny rachillae opposite, widely spaced along the rachis, scarcely more than 1–2 mm long; the clusters of almost bare to completely bare rachides resemble bunches of green hair; fruit a slender pod ..... **Caesalpinioideae** (p. 312)

4. **a.** Leaves scale-like, so small that the willowy drooping branches look leafless; aromatic when crushed; flowers about 1,5 cm long, blue and white, sweetly scented, terminal, their weight adding to the drooping effect; fruit a small, ovoid pod, remaining hidden inside the remains of the persistent calyx ..... **Papilionoideae** (p. 346)
b. Branches dark green with a purplish bloom, inclined to be spine-tipped; fruit long and narrow, up to 9 cm, cylindrical, slightly constricted at intervals, warty, with sticky glands ..... **Capparaceae** (p. 220)

5. **a.** Plants not succulent, leaves not succulent or fleshy **6**
b. Plants succulent, or leaves succulent or fleshy ..... go to page 30

6. **a.** Leaves very small, needle-like or scale-like **7**
b. Leaves narrow but blade flat, with a midrib, but without lateral veins; male cones catkin-like; female cones develop into a round seed with or without a receptacle ..... **Podocarpaceae** (p. 87)

7. **a.** Leaves needle-like **9**
b. Leaves scale-like **8**

8. **a.** Adult leaves scale-like, juvenile leaves needle-like; female cones woody, solitary or in clusters on elongated shoots ..... **Cupressaceae** (p. 90)
b. Leaves very small, scale-like, closely overlapping along the branchlets, yellowish grey-green; fruit a very small capsule ..... **Tamaricaceae** (p. 790)

9. **a.** Leaves spirally arranged or fascicled **13**
b. Leaves opposite or in whorls **10**

10. **a.** Leaves usually in whorls of 3–6 ..... **11**
b. Leaves opposite **12**

11. a. Stipular sheath hairy, with a bristle; single-stemmed shrubs with ascending to almost vertical branches with an interpetiolar ridge; fruit 2 mericarps, crowned with 2 narrowly triangular, different-sized calyx lobes or calyx lobes absent ..... **Rubiaceae** (p. 1021)
b. Stipules absent; leaves with margin so far rolled under that they almost form a cylinder; fruit a small dehiscent capsule, hidden in the withered remains of the old flower ..... **Ericaceae** (p. 859)

12. a. Leaves decussate, bark stringy, branchlets slender covered in fine to woolly hairs, especially when young; fruit a small achene or a small berry, enclosed by 2 bracts, often surrounded by the persistent hypanthium ..... **Thymelaeaceae** (p. 775)
b. Stems with an interpetiolar ridge between the opposite leaves; branchlets, leaves and flowers often with silvery scales; fruit a 2-lobed dehiscent capsule; occurring among boulders in rivers or on the banks in sand and mud ..... **Buddlejaceae** (p. 933)

13. a. Leaves simple **20**
b. Leaves compound **14**

14. a. Leaves usually with 3 leaflets, but sometimes with up to 5, or sometimes the 2 lateral leaflets so reduced as to be scale-like **15**
b. Leaves with 6–8 pairs of leaflets plus a terminal one; leaflets exceedingly narrow and thread-like, about 1,5 cm long, resembling bunches of hair caught in the branchlets; often aromatic; fruit thinly fleshy, splitting into 2 sections which fall away to reveal a single black stone, frequently with a pseudo-aril, often brightly coloured, clasping the base ..... **Burseraceae** (p. 425)

15. a. Leaflets usually longer than the petiole **16**
b. Petiole longer than the leaflets, often petioles at the ends of the branchlets much shorter than those further back; fruit a small flat pod ..... **Papilionoideae** (p. 346)

16. a. Leaves not divided into sections; lower leaves more or less the same as the upper ones ... **17**
b. Leaves stiff, green or grey-green, leaf-like to needle-like or sometimes reduced to the petiole and/or rachis, divided into sections or undivided, lower young leaves very different from upper leaves, flattened; fruit with mericarps equal, unwinged ..... **Apiaceae** (p. 852)

17. a. Leaves with a green-leaf smell when crushed **19**
b. Leaves aromatic when crushed **18**

18. a. Leaves with black dots seen when held up to the light or plants armed with spine-tipped branchlets; fruit a small, ovoid pod, remaining hidden inside the remains of the persistent calyx ..... **Papilionoideae** (p. 346)
b. Terminal leaflet frequently irregularly lobed; lateral leaflets very narrow; fruit thinly fleshy, splitting into 2 sections which fall away to reveal a single black stone, frequently with a pseudo-aril, often brightly coloured, clasping the base ..... **Burseraceae** (p. 425)

19. a. Leaves usually trifoliolate, but sometimes with up to 5 leaflets; fruit cylindrical, slightly constricted between the seeds, 2 cm long, orange ..... **Capparaceae** (p. 220)
b. Leaves trifoliolate, sometimes the 2 lateral leaflets so reduced as to be scale-like, on dwarf spur-branchlets, looking like spiral rosettes; sometimes with cone-like galls ..... **Rosaceae** (p. 245)

20 a. Plants unarmed **21**
b. Branches brittle, short alternating branches at right angles to the main stems, often become spine-tipped; leaves fascicled, yellow-green to grey-green early deciduous; fruit a 4-winged capsule ..... **Nyctaginaceae** (p. 199)

21. a. Leaves in clusters along the stems **23**
b. Leaves spirally arranged, or clustered at the ends of the stems **22**

22. a. Leaf margin rolled under giving the leaves a needle-like appearance; pale grey to whitish below when the undersurface is visible; fruit a dehiscent capsule with a flat tip ..... **Rhamnaceae** (p. 664)
b. Petiole absent; flowerheads at the ends of the stems; female flowers in cone-like structures ..... **Proteaceae** (p. 156)

23. a. Stipules present, sometimes falling early **24**
b. Stipules absent; branchlets white-felted to pale grey; stems either vertical, or, with short shoots in the axils of the leaves sticking out at all angles to the long shoots; leaves almost hairless or covered with white woolly hairs; flowers thistle-like ..... **Asteraceae** (p. 1131)

24. a. Branches brown or grey, bark peeling off in reddish brown, papery strips; leaves on dwarf spur-branchlets, looking like spiral rosettes; sometimes with cone-like galls ..... **Rosaceae** (p. 245)
b. Leaves 1,5–6 cm long without a petiole, densely covered with white woolly hairs; fruit a pod; usually shrubs up to about 2 m high, occurring mainly in the winter-rainfall areas of Western Cape and Northern Cape ..... **Papilionoideae** (p. 346)

PLANTS WITHOUT A PARTICULARLY DISTINCTIVE GROWTH FORM

A Leaves simple

(1) Leaves simple, fascicled on short dwarf spur-branchlets, or crowded at the ends of the branches;

margin entire or margin not entire

1. a. Leaves fascicled on short or dwarf spur-branches **2**
b. Leaves crowded at the ends of the branchlets **26**

2. a. Plants without a milky or watery sap **3**
b. Plants with a milky or watery sap; with or without spines **5**

3. a. Plants unarmed **4**
b. Plants armed with spines **6**

4. a. Leaf margin entire **18**
b. Leaf margin not entire **23**

5. a. Plants with a milky sap; fruit a 3-lobed capsule crowned with 3 persistent stigmas ..... **Euphorbiaceae** (p. 460)
b. Plants with a watery sap, slightly aromatic; fruit thinly fleshy, when mature splitting into 2 sections which fall away to reveal a single black stone, frequently with a pseudo-aril, often brightly coloured clasping the base ..... **Burseraceae** (p. 425)

6. a. Leaf margin not entire **8**
b. Leaf margin entire **7**

7. **a.** Stipules absent **11**
b. Stipules and/or stipular scars present (often 'stipules fall early' so look at new and young growth) **9**

8. **a.** Stipules and/or stipular scars present (often 'stipules fall early' so look at new and young growth); margin with gland-tipped teeth **17**
b. Stipules absent **16**

9. **a.** Spines single or in pairs **10**
b. Spines decussate or in whorls of 3; stems with a ridge between the spines; fruit crowned with the remains of the persistent calyx, or calyx scar ..... **Rubiaceae** (p. 1021)

10. **a.** Stipules usually next to ridges on the stem, shrivelling early; fruit a capsule, leathery or woody, sometimes thinly fleshy, dehiscent; seeds partially to completely surrounded by a thin to fleshy aril ..... **Celastraceae** (p. 587)
b. Stipules bristle-like or spinescent; leaves with a cream-coloured midrib prominent below, apex sometimes with a hair-like tip, a faint smell of mustard when crushed; often with light-coloured bark; flowers a mass of stamens, ovary on a long stalk (gynophore) protruding; fruit on the end of the gynophore ..... **Capparaceae** (p. 220)

11. **a.** Leaves with a green-leaf smell when crushed **12**
b. Leaves sometimes with an unpleasant scent when crushed; fruit a berry... **Solanaceae** (p. 995)

12. **a.** Leaves fold when bent **13**
b. Leaves snap or break when bent; dwarf-spur branchlets often end in spines; fruit an ellipsoid fleshy drupe about 2,5 cm long ..... **Olacaceae** (p. 195)

13. **a.** Spines not particularly at right angles to the stems **15**
b. Spines and stems distinctly at right angles **14**

14. **a.** Leaves on furry knobbly dwarf spur-branchlets just below the spines; branchlets sometimes in whorls of 3; fruit a flattened, beaked capsule ..... **Bignoniaceae** (p. 1006)
b. Leaves on dwarf spur-branchlets on either side of a single spine, or between paired spines; spines sharp and often hooked downwards; fruit enclosed in the hardened perianth or a 4-winged capsule ..... **Nyctaginaceae** (p. 199)

15. **a.** Leaves sometimes distinctly to obscurely 3- to 7-veined from the base; fruit fleshy ..... **Flacourtiaceae** (p. 746)
b. Leaves single-veined from the base; fruit 2-winged appearing as a wing all the way around ..... **Combretaceae** (p. 789)

16. **a.** Bark often peeling or flaking, resinous; sometimes with 2 very small lateral leaflets; fruit thinly fleshy, when mature splitting into 2 sections leaving a single black stone, frequently with a pseudo-aril, often brightly coloured, clasping the base ..... **Burseraceae** (p. 425)
b. Leaves sometimes distinctly to obscurely 3- to 7-veined from the base; margin with teeth often gland-tipped; fruit fleshy ..... **Flacourtiaceae** (p. 746)

17. **a.** Stipules usually next to ridges on the stem, shrivelling early; fruit a capsule, leathery or woody, sometimes thinly fleshy, dehiscent; seeds partially to completely surrounded by a thin to fleshy aril ..... **Celastraceae** (p. 587)
b. Leaves shiny green, groove runs from the midrib into the petiole on the upper surface; fruit a 2- to 4-seeded berry; usually occurring on termite mounds..... **Rhamnaceae** (p. 664)

18. **a.** Stipules present; leaf apex often with a bristle-tip **19**
b. Stipules absent **20**

19. a. Stipules bristle-like; leaves with a cream-coloured midrib prominent below, apex sometimes with a hair-like tip, a faint smell of mustard when crushed; often with light-coloured bark; flowers a mass of stamens, ovary on a long stalk (gynophore) protruding; fruit on the end of the gynophore ..... **Capparaceae** (p. 220)
b. Stipules falling early; leaves bright green, lateral veining clearly visible; fruit a 2-chambered capsule on a slender stalk, with an enlarged persistent calyx, dehiscent ....**Euphorbiaceae** (p. 460)

20. a. Leaves green **22**
b. Leaves bluish green or grey-green **21**

21. a. Leaves with lateral veins hardly visible; bark yellowish -grey; pods with a single, oblong, rather curved, membranous wing ..... **Polygalaceae** (p. 457)
b. Leaves rather thick; fruit an oval, thinly woody capsule, partially splitting into 2 valves, the persistent calyx partly enveloping the lower half; old fruit remaining on the tree for most of the year ..... **Montiniaceae** (p. 240)

22. a. Leaves less than 4 times as long as wide; branches with hairs and glands or hairless, greyish, tending to arch and droop; leaves sometimes with domatia, sometimes with bristles around the margin; fruit a fleshy drupe partially or completely surrounded by the persistent calyx ..... **Boraginaceae** (p. 965)
b. Leaves long and narrow, 4 or more times as long as wide; fruit a greatly inflated, papery thin capsule ..... **Meliaceae** (p. 443)

23. a. Leaves single-veined from the base **24**
b. Leaves 3-veined from the base; flowers with sepals often coloured on the inner surface and petal-like; petals shorter than the sepals; stamens forming a characteristic central mass; fruit a 1- to 4-veined drupe ..... **Tiliaceae** (p. 682)

24. a. Branches without tendrils curving like a ram's horn **25**
b. Branches with conspicuous thick, woody tendrils, curving like a ram's horn, occasionally forming a complete circle; leaves do not appear to be able to lie flat; fruit a fleshy drupe, with the persistent calyx around the base ..... **Linaceae** (p. 401)

25. a. Branches often angular or ridged; leaves hairless; often a yellow pigment visible on exposed undebark; fruit a capsule or a drupe ..... **Celastraceae** (p. 587)
b. Fruit often crowned with 3 persistent stigmas, a 3-lobed capsule or a drupe or a berry .... **Euphorbiaceae** (p. 460)

26. a. Plants without a milky or watery sap **27**
b. Plants with a milky or watery sap; young growth often with rusty or brownish hairs, growing tips with a slightly spiky appearance; fruit a fleshy berry ..... **Sapotaceae** (p. 869)

27. a. Leaves with a single midrib and the first 2 lateral veins not forming a distinct pair at the base **28**
b. Leaves with 3 or more veins from the base, or with a midrib and the first 2 lateral veins as a distinct pair at or near the base (most obvious on the undersurface) **29**

28. a. Leaf margin entire **32**
b. Leaf margin not entire **46**

29. a. Leaves lobed **30**
b. Leaves not lobed or only slightly so **31**

30 a. Leaves ovate; fruit 18–24 carpels opening by apical slits, joined to form a flattened, disc-shaped ring ..... **Malvaceae** (p. 701)
b. Leaves almost circular, margin broadly scalloped or toothed to slightly lobed; showy, red, bell-shaped, about 2 cm long, the red stamens and style protruding from the mouth of the petal tube ..... **Greyiaceae** (p. 662)

31. a. Leaf margin not entire, the teeth ending in glandular hairs that give a shaggy appearance; fruit elliptic, flattened, almost winged ..... **Araliaceae** (p. 844)
b. Leaf margin entire; fruit golden brown or khaki coloured, separating into 1–5 follicles .... **Sterculiaceae** (p. 707)

32. a. Petiole distinct **37**
b. Petiole very short to absent **33**

33. a. Undersurface of the leaves green, sometimes paler green but not discolourous **34**
b. Leaves large discolourous, with pale creamy woolly hairs below; flowers daisy-like, purplish cream, in large flat heads, terminal, honey-scented ..... **Asteraceae** (p. 1131)

34. a. Leaves thickly textured or rather fleshy; broad-based where they join the stem; flowers in flowerheads **36**
b. Leaves tapering to the base where they join the stem; flowers in cymes or umbels **35**

35. a. Leaves and often branches and branchlets, opposite, sometimes domatia in the axils of the lateral veins; interpetiolar ridge on the stems, often more conspicuous on older stems; fruit crowned with the remains of the persistent calyx, or calyx scar ..... **Rubiaceae** (p. 1021)
b. Leaves spiralled, thinly textured; stems without an interpetiolar ridge, bark thin, fibrous and very tough, stripping off in long pieces rather than breaking; flowers greenish; fruit an ovoid berry drawn into a slender point, sometimes tipped with a small tuft of creamy hairs .... **Thymelaeaceae** (p. 775)

36. a. Leaves lie flat; flowers in broad, flat heads, with distinctive shield-like bracts around the base, or female flowers in cone-like structures, or in roundish, pincushion-like heads, or in small groups of 3–12, densely clustered in the axils of the upper leaves and partly obscured by them ..... **Proteaceae** (p. 156)
b. Stems and leaves rather fleshy, wavy, don't lie flat; flowers thistle-like, involucre bell-shaped, with strap-like bracts in 1 row at the base, subtended by 2 large leaf-like structures .... **Asteraceae** (p. 1131)

37. a. Clusters of leaves without a distinctly deformed leaf **38**
b. Leaf clusters often with a deformed leaf; bark becoming roughish with darker, horizontal bands of lenticels; fruit a small capsule, dehiscent; seeds bright red with a sticky coat of slow-drying resin ..... **Pittosporaceae** (p. 241)

38. a. Leaves with lateral veins not quite reaching the margin, curving around or petering out **40**
b. Leaves with lateral veins very distinct, ridged, more or less parallel, almost reaching the margin **39**

39. a. Leaves with lateral veins, numerous, close together, branching and forming a 'Y' just before reaching the margin; fruit a velvety capsule, splitting to reveal the bright red, semi-fleshy aril which covers the seed ..... **Sapindaceae** (p. 638)
b. Leafy growing tip characteristically hard and stiff, distinctive; fruit a fleshy drupe .... **Euphorbiaceae** (p. 460)

40. a. Leaves mostly shorter than 15–18 cm **41**
b. Leaves very large, obovate-oblong, 15–40 cm long or more; fruit a berry with a leathery skin and numerous tiny seeds; trees with a straight clean bole and comparatively short branches high up ..... **Gentianaceae** (p. 932)

41. a. Undersurface of the leaves green, sometimes paler green but not discolourous **42**
b. Undersurface of the leaves with pale to whitish hairs or white-felted; flowers thistle-like .... **Asteraceae** (p. 1131)

42. a. Leaves without translucent gland dots **43**
b. Leaves with translucent gland dots, sometimes with glandular scales when young; young leaves on growing tips pinkish maroon; fruit on short stalks, massed along the branchlets just below the leaves ..... **Myrsinaceae** (p. 866)

43. a. Leaves spirally arranged, with lateral veins visible **45**
b. Leaves and often branches and branchlets opposite **44**

44. a. Leaves often with domatia in the axils of the lateral veins; interpetiolar ridge on the stems, often more conspicuous on older stems; fruit crowned with the remains of the persistent calyx, or calyx scar ..... **Rubiaceae** (p. 1021)
b. Leaves with lateral veins hardly visible, margin rolled under; stems without an interpetiolar ridge; fruit a thinly fleshy drupe; occurring in coastal dune bush and forest .... **Oleaceae** (p. 912)

45. a. Young branchlets with bark peeling and flaking off in rings and strips, or with conspicuous leaf-scars, sometimes crater-like; leaves sometimes with glands on the blade, or next to the midrib or on the petiole; fruit 2-winged appearing as a wing all the way around; branches horizontal giving a tiered or layered look ..... **Combretaceae** (p. 789)
b. Mature leaves often markedly different in size and a much smaller leaf at the bottom of the branchlet; sometimes look dirty with patches of darkish brown peltate scales; calyx enlarging and becoming conspicuous at the base of the fruit; seeds with 2 lines radiating from the apex and joining at the base ..... **Ebenaceae** (p. 885)

46. a. Occurring inland **47**
b. Strictly coastal, associated with mangrove swamps, always near water; better adapted to equally marshy but less saline conditions, also occurring on sand dunes and river banks; fruit 1-seeded, dispersed by the sea **49**

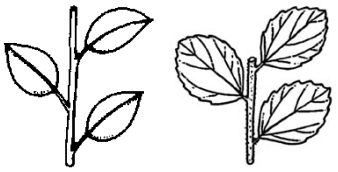
47. a. Petiole distinct **48**
b. Petiole absent; leaves with 3–10 glandular teeth around the margin; flowers in roundish, pincushion-like heads, or in small groups of 3–12, densely clustered in the axils of the upper leaves and partly obscured by them ..... **Proteaceae** (p. 156)

48. a. Petiole stout, up to 1,5 cm long; leaf margin conspicuously and closely spine-toothed on young and coppice growth, usually entire on mature trees; fruit a velvety capsule, splitting to reveal the bright red, semi-fleshy aril which covers the seed ..... **Sapindaceae** (p. 638)
b. Petiole broad-based, clasping the stem, up to 2 cm long; leaf margin irregularly and jaggedly toothed; flowers daisy-like, yellow ..... **Asteraceae** (p. 1131)

49. a. Leaves shorter than 10 cm, petiole absent; supported by buttress and stilt roots; fruit ovoid to oblong, woody, tipped with the persistent calyx, style and stigma . **Combretaceae** (p. 789)
b. Leaves large, longer than 10 cm, petiole very short, purple; fruit dangling on long stalks, conical to ovoid, crowned by the remains of the persistent calyx and style, fleshy at first, becoming hard, fibrous and coppery reddish green, the fibrous coat giving it buoyancy in the water ..... **Lecythidaceae** (p. 782)

(2) Leaves simple, alternate (distichous)

in 2 rows alternately on opposite sides of the stem; margin entire or margin not entire



1. **a.** Plants without a milky or watery sap **2**
b. Plants with a milky or watery sap **7**

2. **a.** Leaves with a single midrib and the first 2 lateral veins do not start as a distinct pair right at the base **3**
b. Leaves with 3 or more veins from the base, or with a midrib and the first 2 lateral veins as a distinct pair at, or near the base (most obvious on the undersurface) **8**

3. **a.** Plants unarmed **4**
b. Plants armed with spines **13**

4. **a.** Undersurface of the leaves green, sometimes paler green but not discolourous **5**
b. Leaves with undersurface of the leaves silvery or pale grey to whitish, with numerous lateral veins close together **16**

5. **a.** Leaves with midrib not indented and leaves not appearing folded upwards **6**
b. Leaves look as though they have been creased along the midrib and folded upwards **17**

6. **a.** Stems without stipules and the growing tip is often at an angle to the axis of the stem ... **18**
b. Stipules and/or stipular scars present on the stems (often 'stipules fall early' so look at new and young growth) **20**

7. **a.** Plants with a watery sap ..... **Euphorbiaceae** (p. 460)
b. Plants with a milky to watery sap ..... **Moraceae** (p. 129)

8. **a.** Leaves with more than 3 veins from the base **11**
b. Leaves with only 3 veins, or with a midrib and 1 distinct pair of lateral veins at the base (sometimes with a faint second pair) **9**

9. **a.** Leaves with a green-leaf smell when crushed, base symmetric or asymmetric **10**
b. Leaves with a strong smell when crushed, base symmetric; stems cylindrical with swollen nodes, like a grape-vine ..... **Vitaceae** (p. 676)

10. **a.** Leaves with stellate hairs or hairless, base symmetric or asymmetric, undersurface grey to whitish or green; flowers with sepals often coloured on the inner surface and petal-like; petals shorter than the sepals; stamens numerous, all fertile, forming a characteristic central mass; fruit a 1- to 4-lobed very thinly fleshy drupe ..... **Tiliaceae** (p. 682)
b. Leaves usually green below; fruit a 3-lobed capsule, often crowned with 3 persistent stigmas ..... **Euphorbiaceae** (p. 460)

11. **a.** Leaves not lobed; margin not entire; fruit a fleshy drupe **12**
b. Leaves with 2 lobes, margin of lobes entire; fruit a dehiscent pod ..... **Caesalpinioideae** (p. 312)

12. a. Leaves with base markedly to slightly asymmetric, margin toothed around the upper two-thirds or all the way around and veins indented above ..... **Celtidaceae** (p. 125)
b. Leaves often discolorous; stipules sometimes spinescent, characteristically 1 hooked sharply downwards, the other curved slightly upwards ..... **Rhamnaceae** (p. 664)

13. a. Spines single **15**
b. Spines often in pairs **14**

14. a. Branchlets zigzagging between the nodes; leaf apex with a conspicuous hair-like bristle at the tip; margin usually entire, occasionally sharply toothed; fruit a round drupe tipped with the remains of the long, slender stigmas ..... **Celtidaceae** (p. 125)
b. Spines 1–3 mm long, straight, yellowish; leaf margin with shallow glandular teeth; fruit a 3-lobed dehiscent capsule ..... **Euphorbiaceae** (p. 460)

15. a. Plants seldom climbers, without distinctive grappling-hooks formed by the flower stalks **23**
b. Leaves slightly aromatic when crushed; plants scramble into other trees using distinctive grappling-hooks in the form of a 'C', formed by the flower stalks ..... **Annonaceae** (p. 202)

16. a. Leaves oblong to elliptic, veins look raised above as well as below; petiole 0,5–1 cm long, fruit ellipsoid, up to 5 × 3,5 cm, russet-yellow, scaly and pitted ..... **Chrysobalanaceae** (p. 250)
b. Leaves ovate to round, petiole up to 4 cm long; fruit kidney-shaped ..... **Anacardiaceae** (p. 538)

17. a. Leaves with midrib almost hidden above; petiole with 2 distinct swellings; fruit a pod with the tip drawn out into a long point, dehiscent ..... **Papilionoideae** (p. 346)
b. Leaves with midrib furrowed along the top, snap when bent; branches slightly ridged; fruit a drupe, almost enveloped by the fleshy, persistent calyx ..... **Olacaceae** (p. 195)

18. a. Leaves mostly longer than 2,5 cm, but if shorter then without gand dots **19**
b. Leaves small, shorter than 2,5 cm, gland dots inconspicuous, midrib prominent below, lateral veins obscure, margin entire or with very small teeth around the upper half; stems distinctly brown, fruit a 1-seeded pink drupe ..... **Myrsinaceae** (p. 866)

19. a. Leaves not aromatic when crushed, sometimes look dirty, with patches of darkish brown peltate scales; often a very wide range of leaf sizes with a much smaller leaf at the bottom of the branchlet; calyx enlarging and becoming conspicuous at the base of the fruit; seeds 1–8, with 2 lines radiating from the apex and joining at the base ..... **Ebenaceae** (p. 885)
b. Leaves with a blue-green or metallic sheen and a fresh or slightly citrus scent when crushed; fruit a cluster of berries or a syncarp (several united fleshy fruit) ..... **Annonaceae** (p. 202)

20. a. Leaves distinctly simple, not arranged so as to resemble pinnate leaves **21**
b. Leaves closely arranged along very slender green branchlets, giving the impression of being pinnate; stems with scale-like leaves (cataphylls) that sometimes become spinescent..... **Euphorbiaceae** (p. 460)

21. a. Leaves with midrib only ridged below **22**
b. Leaves with midrib ridged above as well as below, lateral veins numerous, parallel, closely spaced, usually visible above, may or may not be visible below; margin toothed or entire; fruit thinly fleshy drupelets, joined to the swollen receptacle and surrounded by pink to red enlarged petal-like sepals..... **Ochnaceae** (p. 720)

22. a. Youngest branchlets usually round; leaves stiffly leathery to softly textured, margin entire or not entire; armed or unarmed **23**
b. Youngest branchlets distinctly flattened, stipules stick out from each side and so the branchlets look scaly rather like an insect's or lizard's leg; leaf margin entire; unarmed; fruit a small fleshy drupe ..... **Erythroxylaceae** (p. 402)

23. a. Fruit a 3-lobed capsule, drupe or berry crowned with 3 persistent stigmas ..... **Euphorbiaceae** (p. 460)
b. Fruit a woody capsule splitting into 2–8 valves; flowers with a central mass of stamens ..... **Flacourtiaceae** (p. 746)

(3) Leaves simple, spirally arranged

a. margin entire

1. a. Plants without a milky or yellow sap **2**
b. Plants with a milky, yellow or watery sap **15**

2. a. Leaves with a single midrib and the first 2 lateral veins do not start as a distinct pair right at the base **3**
b. Leaves with 3 or more veins from the base, or with a midrib and the first 2 lateral veins as a distinct pair at or near the base (most obvious on the undersurface) **25**

3. a. Plants unarmed **4**
b. Plants armed with spines or prickles **38**

4. a. Not associated with mangrove swamps **5**
b. Strictly coastal; occurring on the landward side of, or fringing mangrove swamps where fresh water mingles with and probably predominates over the sea water, adapted to equally marshy but less saline conditions, also occurring on sand dunes and in littoral scrub **47**

5. a. Leaves with lateral veins visible even if only slightly so **6**
b. Leaves with a midrib and without lateral veins ..... **Podocarpaceae** (p. 87)

6. a. Petiole present, sometimes very short but distinct **7**
b. Petiole absent, usually masked by the decurrent leaf base **50**

7. a. Undersurface of the leaves green, sometimes paler green but not discolourous **8**
b. Undersurface of the leaves silvery or pale grey to whitish or brownish to golden **52**

8. a. Leaves not aromatic when crushed **9**
b. Leaves aromatic when crushed **62**

9. a. Petiole green to yellowish, not pink or purple-tinged **10**
b. Petiole with a purple or pink tinge, sometimes with a channel or groove along the top ... **67**

10. a. Petiole without a swelling or pulvinus just below the blade **11**
b. Petiole with a conspicuous swelling or pulvinus at or just below the blade **71**

11. a. Leaves without a sub-marginal vein **12**
b. Leaves with lateral veins almost reaching the margin, looping and joining up to form a sub-marginal vein **75**

12. a. Leaves with lateral veins, if visible not parallel **13**
b. Leaves with numerous parallel lateral veins, may or may not divide just before reaching the margin, almost at right angles to the midrib **77**

13. a. Leaves without stalked glands on the midrib at the junction with the petiole **14**
b. Leaves with 2 little stalked glands rather like a bee's sting on the midrib at the junction with the petiole **80**

14. a. Stems with stipules and/or stipular scars (often "stipules fall early" so look at new and young growth) **95**
b. Stems without stipules; growing tip often at an angle to the axis of the stem **81**

15. a. Plants unarmed **17**
b. Plants armed with spines **16**

16. a. Sap milky ..... **Moraceae** (p. 129)
b. Sap watery or resinous, often aromatic ..... **Burseraceae** (p. 425)

17. a. Leaves not lobed **18**
b. Leaves with 5–11 lobes ..... **Euphorbiaceae** (p. 460)

18. a. Sap milky **21**
b. Sap watery or resinous **19**

19. a. Leaves with undersurface green, sometimes paler green or bluish green but not discolourous **20**
b. Leaves with undersurface almost silvery white and woolly, 3-veined from the base; stipules persistent; fruit a very small nut, enclosed in the papery, persistent perianth tube .... **Urticaceae** (p. 154)

20. a. Stipules absent; sap often aromatic; leaves single-veined from the base; bark sometimes peeling or flaking; fruit thinly fleshy, splitting into 2 sections which fall away to reveal a single black stone, frequently with a pseudo-aril, often brightly coloured, clasping the base .... **Burseraceae** (p. 425)
b. Stipules and/or stipular scars present (often 'stipules fall early' so look at new and young growth); leaves single-veined or 3-veined from the base, sometimes with 2 little glands rather like a bee's sting at the junction of the leaf and the petiole; fruit a 1- to 3-lobed capsule, drupe or berry, crowned with 3 persistent stigmas ..... **Euphorbiaceae** (p. 460)

21. a. Stipules if present not conspicuous **22**
b. Stipules frequently conspicuous, enveloping the leaf bud, but falling as soon as the leaves unfold, to leave a conspicuous scar around the stem; petiole stops at the midrib and looks as though it has been stuck on below; bear figs or fig-like fruit ..... **Moraceae** (p. 129)

22. a. Bark not light yellowish brown, not peeling in papery sheets and branchlets not dividing into 3 at the end **23**
b. Plants with bark peeling in light yellowish brown, papery sheets; or broad papery rings, or with branchlets dividing into 3 at the end, sometimes spine-tipped; or with red petioles .... **Euphorbiaceae** (p. 460)

23. a. Leaves with a green-leaf smell when crushed **24**
b. Leaves smell pungent when crushed, bluish green, rather thick; fruit an oval, thinly woody capsule, partially splitting into 2 valves, persistent calyx partly enveloping the lower half; old fruit remaining on the tree for most of the year ..... **Montiniaceae** (p. 240)

24. a. Young growth often rusty or brownish; growing tips with a slightly spiky appearance; leaves with lateral veins barely visible, or distinct, usually joining up before the margin; fruit a berry ..... **Sapotaceae** (p. 869)
b. Leaves with numerous, distinct parallel lateral veins, close together, going right to the margin without joining up; fruit kidney-shaped usually smaller than 1,5 cm long or in diameter .... **Anacardiaceae** (p. 538)

25. a. Leaves with only 3 veins, or with a midrib and 1 distinct pair of lateral veins (or sometimes a faint second pair) at the base **33**
b. Leaves with more than 3 veins from the base **26**

26. a. Not occurring in mangrove swamps or right on the coast **27**
b. Strictly coastal, often associated with mangrove swamps; with stipules, sometimes conspicuous; fruit indehiscent, rather fleshy ..... **Malvaceae** (p. 701)

27. a. Leaf base symmetric **28**
b. Leaves with base markedly asymmetric, tapering on 1 side, square to rounded on the other, with 5 conspicuous veins, connected by parallel net-veining, perpendicular to the main veins; fruit fleshy, flattened, broadly tapering to the apex, crowned with the remains of the persistent calyx ..... **Alangiaceae** (p. 857)

28. a. Apex and margin of the leaves with lobes **29**
b. Apex and margin of the leaves without lobes (ignore base, which may or may not be lobed) **30**

29. a. Leaves with 3–5 lobes, feel hairy and sometimes harsh to the touch; fruit golden brown or khaki coloured, separating into 1–5 follicles ..... **Sterculiaceae** (p. 707)
b. Leaves divided into 2 lobes; fruit a dehiscent pod ..... **Caesalpinioideae** (p. 312)

30. a. Leaves with a distinct petiole **31**
b. Leaves swollen at the base but without a petiole; fruit an inflated pod .... **Papilionoideae** (p. 346)

31. a. Nodes on stems and branches not thickened **32**
b. Stems and branches with conspicuously thickened nodes giving them a jointed appearance; with a leaf-opposed short lateral shoot which sometimes give a false impression of an opposite leaf; leaves with 3–11 veins from the base with the 3 middle veins reaching the apex; fruit a small berry ..... **Piperaceae** (p. 120)

32. a. Leaves ovate to almost circular, with a distinctive mark, an elongate slit or gland (extra-floral nectary), on 1 or more of the veins on the undersurface; fruit a capsule ....**Malvaceae** (p. 701)
b. Leaves hairy with stellate hairs at first, soon becoming hairless, stipules long slender falling very early; fruit 2- to 3-lobed, each lobe with 2 large, velvety, membranous wings .... **Tiliaceae** (p. 682)

33. a. Leaves not lobed; stipules and/or stipular scars present (often 'stipules fall early' so look at new and young growth) **34**
b. Leaves with 3 lobes and 3 main veins from the base, base not lobed; stipules absent; bark smooth, grey, bleaches on the sunny side; fruit looks like a nut with 2 thin wings ....**Hernandiaceae** (p. 219)

34. a. Leaves with undersurface green, sometimes paler green or bluish green but not discolourous **36**
b. Leaves with undersurface silvery or pale grey to whitish **35**

35. a. Leaves with base stopping abruptly at the petiole, can be made to stick together like velcro, top surface to bottom surface; fruit a very small nut, enclosed in the papery, persistent perianth tube ..... **Urticaceae** (p. 154)
b. Leaves with base tapering down the petiole; flowers thistle-like ..... **Asteraceae** (p. 1131)

36. a. Leaves greenish below; stipules and/or stipular scars present (often 'stipules fall early' so look at new and young growth) **37**
b. Leaves dull bluish green below; net-veining very distinct; stipules absent; fruit completely enveloped by the persistent, enlarged receptacle, which may become hard or fleshy .... **Lauraceae** (p. 213)

37. a. Leaves often with a pair of glands looking like a small bee's sting at or near the junction with the petiole; fruit a 3-lobed capsule, drupe or berry crowned with 3 persistent stigmas .... **Euphorbiaceae** (p. 460)
b. Leaves stiffly leathery, armed or unarmed; fruit fleshy ..... **Flacourtiaceae** (p. 746)

38. a. Branchlets or stipules spinescent **39**
b. Spines formed by the remains of persistent petioles, slightly curved; climbing or scrambling shrubs with long trailing branches, or lianes; leaves opposite on flowering branches; fruit a samara, mostly 4- to 5-winged, indehiscent ..... **Combretaceae** (p. 789)

39. a. Spines or spine-tipped branchlets single **40**
b. Spines in pairs, downward-hooked, persistent and distinctive even on the old wood; frequently a scrambler or liane; fruit hard-shelled, rather pendulous on a stout stalk (gynophore) ..... **Capparaceae** (p. 220)

40. a. Bark not peeling and resinous **41**
b. Bark often peeling or flaking; resinous; fruit thinly fleshy, splitting into 2 sections to reveal a single black stone, with a pseudo-aril, brightly coloured, clasping the base .... **Burseraceae** (p. 425)

41. a. Dwarf-spur branchlets absent **45**
b. Dwarf-spur branchlets present, sometimes spinescent **42**

42. a. Branches without white woolly hairs **43**
b. Branchlets with whitish woolly hairs, with very sharp spines or branches short and spiny, marked with lines running down from the nodes; fruit a fleshy berry ... **Solanaceae** (p. 995)

43. a. Leaves distinctly single-veined from the base **44**
b. Leaves obscurely 3- to 7-veined from the base; fruit fleshy ..... **Flacourtiaceae** (p. 746)

44. a. Leaves fold when bent; fruit with 2 wings appearing as 1 wing all the way around .... **Combretaceae** (p. 789)
b. Leaves snap when bent; fruit an ellipsoid fleshy drupe ..... **Olacaceae** (p. 195)

45. a. Plants seldom climbers, without distinctive grappling-hooks formed by the flower stalks; stipules and/or stipular scars present **46**
b. Leaves slightly aromatic when crushed; stipules absent; plants scramble into other trees supported by distinctive grappling-hooks in the form of a 'C', formed by the flower stalks .... **Annonaceae** (p. 202)

46. a. Leaves without brownish hairs below; fruit fleshy ..... **Flacourtiaceae** (p. 746)
b. Leaves with midrib and lateral veins with brownish hairs below; evergreen scandent shrub to lax tree; rare; fruit a dehiscent capsule, splitting into 3 sections ..... **Rhamnaceae** (p. 664)

47. a. Leaves not discolourous **48**
b. Leaves discolourous, with conspicuous silvery scales and occasional dotted brown scales below; fruit 5 joined, woody, oblong carpels, with a distinct keel along the back, float in water ..... **Sterculiaceae** (p. 707)

48. a. Leaves mostly longer than 10 cm; petiole distinct; with no mangrove modifications; fruit float in the water **49**
b. Leaves shorter than 10 cm, petiole absent; with breathing roots and sometimes buttress or prop roots; fruit woody, ovoid to oblong; seeds germinating while still on the plant .... **Combretaceae** (p. 789)

49. a. Leaves obovate-oblong to oblanceolate, midrib and petiole purplish, base running down the petiole; fruit dangling on long stalks, conical to ovoid, crowned by the remains of the persistent calyx and style, fleshy, becoming hard and fibrous ..... **Lecythidaceae** (p. 782)
b. Leaves obovate to almost round, apex notched to deeply notched; fruit cylindrical, woody, rather fibrous, about 9 cm long with 5 clearly defined ridges ..... **Escalloniaceae** (p. 240)

50. a. Leaves thickly textured or rather fleshy; broad-based where they join the stem; flowers in flowerheads **51**
b. Leaves thinly textured, tapering to the base where they join the stem; bark thin, fibrous and very tough, stripping off in long pieces rather than breaking; flowers greenish; fruit an ovoid berry drawn into a slender point, sometimes tipped with a small tuft of creamy hairs .... **Thymelaeaceae** (p. 775)

51. a. Leaves lie flat; flowers in broad, flat heads, with distinctive shield-like bracts around the base, or female flowers in cone-like structures, or in roundish, pincushion-like heads, or in small groups of 3–12 densely clustered in the axils of the upper leaves and partly obscured by them .... **Proteaceae** (p. 156)
b. Stems and leaves rather fleshy, leaves wavy, don't lie flat, sometimes whitish below, sometimes with lobes near the apex; flowers thistle-like ..... **Asteraceae** (p. 1131)

52. a. Leaves aromatic when crushed **53**
b. Leaves with a green-leaf smell when crushed **54**

53. a. Leaves with red dots below; petiole slender; little stalked glands on the midrib at the junction with the petiole; smell of lavender when crushed; fruit a 3-lobed capsule .... **Euphorbiaceae** (p. 460)
b. Leaves without red dots below, petiole very short, no longer than 7 mm; smell of camphor when crushed; flowers thistle-like; often with little white galls looking like cotton waste .... **Asteraceae** (p. 1131)

54. a. Leaves green above **55**
b. Leaves silvery greyish-green on both surfaces, sparsely hairy on the upper surface, with dense silky hairs below; young branches velvety; fruit a hard, inflated pod, covered with brown, woolly hairs ..... **Papilionoideae** (p. 346)

55. a. Leaves with lateral veins, if visible, not close together and not at right angles to the midrib **58**
b. Leaves with numerous lateral veins close together, may or may not divide just before reaching the margin **56**

56. a. Leaves with lateral veins ridged on 1 or both surfaces, even if only slightly so **57**
b. Leaves with midrib very prominent, lateral veins somewhat deep-seated but clearly visible; young growth often rusty or brownish; growing tips with a slightly spiky appearance; fruit a fleshy berry ..... **Sapotaceae** (p. 869)

57. a. Leaves velvety, lateral veins flat or indented above, margin rolled under; fruit kidney-shaped, usually smaller than 1,5 cm long or in diameter ..... **Anacardiaceae** (p. 538)
b. Leaves with lateral veins appearing raised above as well as below, margin wavy; fruit a fleshy drupe, up to 5 × 3,5 cm, russet-yellow, scaly and pitted ..... **Chrysobalanaceae** (p. 250)

58. a. Leaves with undersurface creamy to brownish or golden brown, margin entire; young stems and leaves with velvety brown hairs **61**
b. Leaves with undersurface silvery or pale grey to whitish, margin entire or not entire **59**

59. a. Leaves elliptic to obovate, less than 3 times as long as wide, base sometimes tapering down the petiole **60**
b. Leaves long and narrow, stems and petioles reddish; strictly riverine ..... **Salicaceae** (p. 120)

60. a. Leaves with base tapering down the petiole; flowerheads thistle-like, in small heads, in axillary and terminal sprays ..... **Asteraceae** (p. 1131)
b. Leaves fresh olive-green above, with domatia sometimes present; an occasional bright yellow leaf often seen; fruit a rough, warty capsule; seeds enveloped in a bright orange-red sticky coating; host plant to the caterpillars of the butterfly *Acraea horta* which can be very numerous and completely defoliate the trees ..... **Flacourtiaceae** (p. 746)

61. a. Leaves leathery; young growth often with rusty or brownish hairs, growing tips with a slightly spiky appearance; fruit a fleshy berry ..... **Sapotaceae** (p. 869)
b. Occurring in mist-belt forest, along streams and rivers where it is frequently dominant, and in swampy places; flowers in rather ragged, spiky heads; fruit a small, velvety capsule, opening at the tip into 2 valves, each of which itself splits into 2 ..... **Hamamelidaceae** (p. 245)

62. a. Leaves with translucent gland dots seen when held against a strong light (10x lens) **63**
b. Leaves without translucent gland dots **64**

63. a. Leaves with lateral veins curving around at an acute angle to the midrib, going towards and almost reaching the apex; conspicuous domatia below, often showing as bumps above; bark distinctively pale grey, often almost white, thinly flaking; fruit a small dehiscent capsule partly surrounded by the persistent calyx, old capsules often remaining on the tree for months ..... **Heteropyxidaceae** (p. 840)
b. Leaves with lateral veins indistinct, at about 45° to the midrib, glossy dark green with veins obscure; smell and taste peppery, snap when bent; fruit a berry up to 4 cm in diameter, skin leathery, covered with gland dots ..... **Canellaceae** (p. 741)

64. a. Branches without a deformed leaf in each cluster **65**
b. Leaves with a resinous smell, often a deformed leaf in each cluster; bark becoming roughish with darker, horizontal bands of lenticels; fruit a small, creamy brown dehiscent capsule, seeds bright red with a sticky coat of slow-drying resin ..... **Pittosporaceae** (p. 241)

65. a. Leaves without yellowish glandular hairs **66**
b. Leaves with minute yellowish glandular hairs below; flowers and fruits in spikes; fruit a small drupe often waxy ..... **Myricaceae** (p. 122)

66. a. Leaves with brownish or rusty hairs on the undersurface; flowers thistle-like; fruit a small nutlet with a apical tuft of bristles ..... **Asteraceae** (p. 1131)
b. Leaves slightly to markedly blue-green on the undersurface, fine net-veining very distinct; sometimes with conspicuous domatia; fruit partly or completely enveloped by the persistent, enlarged receptacle, which may become hard or fleshy to woody ..... **Lauraceae** (p. 213)

67. a. Young branches round **68**
b. Young branches 4-angled, reddish; colour from the petiole running into the midrib, margin sometimes rolled under; fruit a 1- to 3-lobed dry, woody, dehiscent capsule ..... **Celastraceae** (p. 587)

68. a. Leaves without a sub-marginal vein **69**
b. Leaves with lateral veins almost reaching the margin, looping and joining up to form a sub-marginal vein; flowers on elongated catkin-like spikes ..... **Proteaceae** (p. 156)

69. a. Leaves with apex rounded and often notched **70**
b. Leaves with apex tapering to a point, margin sometimes with sharp teeth, but these can be difficult to find, pale patches sometimes seen when the leaves are held up to the light; fruit a berry ..... **Aquifoliaceae** (p. 587)

70. a. Young leaves on growing tips pinkish maroon; leaves with translucent gland dots, sometimes with glandular scales when young; fruit on short stalks, massed along the branchlets just below the leaves ..... **Myrsinaceae** (p. 866)
b. Leaves softly leathery, often the pink colour in the petiole running into the yellowish midrib, margin wavy, rolled under; when a leaf is broken carefully and pulled apart, wispy threads can be seen linking the 2 halves; fruit black, kidney-shaped, partly covered by a red fleshy pseudo-aril ..... **Icacinaceae** (p. 635)

71. a. Swelling on the petiole slightly below the blade, does not look as though the petiole has been stuck on **72**
b. Petiole looks as though it has been stuck onto the midrib, 2 small leafy projections (stipels) at the join; sometimes occasional leaves with 3 or 5 leaflets on the same tree; fruit a finely velvety pod, indehiscent ..... **Papilionoideae** (p. 346)

72. a. Leaves more or less flat **73**
b. Leaves look as though they have been folded and creased along the midrib; fruit a pod with the tip drawn out into a long point, dehiscent ..... **Papilionoideae** (p. 346)

73. a. Leaves without translucent gland dots; stipules inconspicuous or absent **74**
b. Leaves with tiny translucent gland dots; stipules falling early leaving a scar around the stem; fruit a 3- to 5-lobed woody capsule, on a long stalk, dehiscent only after falling ..... **Euphorbiaceae** (p. 460)

74. a. Bark usually flaking; fruit 3–5 leathery or woody follicular carpels, splitting longitudinally ..... **Sterculiaceae** (p. 707)
b. Leaves with midrib cream-coloured, prominent below; apex with a conspicuous hair-like tip; petiole yellowish, nearly as long as the leaf, with a swelling and a bend looking a bit like an arthritic joint; young branches yellowish with conspicuous creamy white lenticels; fruit a slender pod, often irregularly constricted between the seeds ..... **Capparaceae** (p. 220)

75. a. Leaves not resinous and sticky **76**
b. Leaves and stems resinous, shiny and sometimes sticky; branches reddish brown, stringy; pods with 2–3 wings ..... **Sapindaceae** (p. 638)

76. a. Fruit a 3-lobed capsule, drupe or berry, crowned with 3 persistent stigmas ..... **Euphorbiaceae** (p. 460)
b. Flowers and fruit on elongated catkin-like spikes ..... **Proteaceae** (p. 156)

77. a. Leaves with midrib flat or indented above, lateral veins, if visible, more ridged below than above **79**
b. Leaves with midrib ridged above as well as below, lateral veins, usually visible above, may or may not be visible below **78**

78. a. Leaves with lateral veins numerous, very fine, often more distinct above than below; fruit thinly fleshy drupelets, joined to the swollen receptacle and surrounded by pink to red enlarged petal-like sepals ..... **Ochnaceae** (p. 720)
b. Leaves with lateral veins appearing raised above as well as below, margin wavy; fruit a fleshy drupe, up to 5 × 3,5 cm, russet-yellow, scaly and pitted ..... **Chrysobalanaceae** (p. 250)

79. a. Leaves appearing unable to lie flat, as though a thread has been pulled through the midrib making it too tight for the blade, most lateral veins branching and forming a 'Y' just before the margin; fruit a velvety capsule, splitting to reveal the bright red, semi-fleshy aril which covers the seed ..... **Sapindaceae** (p. 638)
b. Leaves velvety, margin rolled under, lateral veins sometimes branching and forming a 'Y' just before the margin; fruit kidney-shaped, usually smaller than 1,5 cm long or in diameter ..... **Anacardiaceae** (p. 538)

80. a. Leaves without a very pronounced drip-tip; fruit a 3-lobed capsule, drupe or berry crowned with 3 persistent stigmas ..... **Euphorbiaceae** (p. 460)
b. Leaf apex attenuate forming a very pronounced drip-tip; occurring in forest; fruit a fleshy obovoid drupe, 4,5 × 2,5 cm, stipules absent ..... **Chrysobalanaceae** (p. 250)

81. a. Leaves with lateral veins prominent, form distinct ridges, particularly below **87**
b. Leaves with lateral veins that may or may not be visible, if visible they are not ridged, or only slightly so **82**

82. a. Leaves often look dirty, due to the presence a brownish exudate **83**
b. Leaves usually without dirty-looking patches **84**

83. a. Leaves leathery, margin slightly to markedly wavy, young parts with a granular rust-coloured exudate; stipules absent; fruit a round berry, usually 1-seeded ..... **Ebenaceae** (p. 885)
b. Growing tip at an angle to the axis of the stem; often a very wide range of leaf sizes with a much smaller leaf at the bottom of the branchlet; calyx enlarging to become conspicuous at the base of the fruit; seeds 1–8, ellipsoid or shaped like an orange segment, with 2 lines radiating from the apex and joining at the base ..... **Ebenaceae** (p. 885)

84. a. Leaves without a hair-like or bristle tip **86**
b. Leaves with lateral veins indistinct, apex rounded or tapering, with a hair-like or bristle tip **85**

85. a. Stems round; flowers rather pea-like, the keel petal with a dark tuft at the end; fruit a flattened, very narrowly winged capsule ..... **Polygalaceae** (p. 457)
b. Stems angled, not round; leaves upright, face the stems; fruit a drupe, crowned with the remains of the persistent calyx ..... **Santalaceae** (p. 194)

86. a. Trunk and branches fluted and ridged, square in section; bark distinctive, smooth, almost shiny green-grey to grey-blue, peeling away in thin plate-like flakes, becoming blotched; fruit resembling a small, sharply pointed acorn, many-toothed persistent calyx forming a cup around the lower third ..... **Boraginaceae** (p. 965)
b. Leaves stiff, thick, leathery, apex rounded, notched, curving downwards; branches widely spaced, horizontal; fruit a spherical capsule, up to 3 cm in diameter; eventually splitting into 3 valves ..... **Celastraceae** (p. 587)

87. a. Leaves hairy or velvety on 1 or both surfaces **92**
b. Leaves hairless, sometimes slightly hairy or velvety when very young **88**

88. a. Leaves with gland dots or extra-floral nectaries **90**
b. Leaves without gland dots or extra-floral nectaries **89**

89. a. Occurring over a wide range of habitats but seldom associated with mountain forest, sometimes occurring in forested gullies or coastal forest; flowers with petals spreading, usually strap-shaped, white or greenish to cream, ageing to yellow; stamens joined to form a distinctive tube; fruit a woody capsule splitting into 5 valves; seeds partly or wholly covered by a brightly coloured aril ..... **Meliaceae** (p. 443)
b. Occurring in evergreen mountain forest; flowers yellowish green, inconspicuous; fruit a fleshy drupe ..... **Olacaceae** (p. 195)

90. a. Leaves with distinct glands or gland dots **91**
b. Leaves with extra-floral nectaries on the blade, next to the midrib or on the petiole, more visible on young leaves, a thickening on older leaves; young branchlets with bark, peeling and flaking off in rings and strips of purplish green; fruit with 2 wings, appearing as 1 wing all the way around; branches horizontal with a tiered or layered look ..... **Combretaceae** (p. 789)

91. a. Leaves slightly to markedly blue-green on the undersurface, translucent gland dots seen when held against a strong light; fruit completely enveloped by the persistent, enlarged receptacle, which may become hard or fleshy to woody ..... **Lauraceae** (p. 213)
b. Leaves with 2 dark glands near the base or scattered on the undersurface; tips of the branchlets often twining; fruit twin nutlets, each with a broad membranous wing up to 3 × 2,2 cm, resembling a dark reddish-brown moth ..... **Malpighiaceae** (p. 456)

92. a. Leaves softly hairy or velvety **93**
b. Leaves often rough or harsh to the touch, sometimes smooth; branchlets round; fruit a fleshy drupe partially or completely surrounded by the persistent calyx ..... **Boraginaceae** (p. 965)

93. a. Stems without stipular appendages; not the daisy and thistle family **94**
b. Stipules absent but sometimes with stipular-like appendages looking like ears; leaves velvety, base sometimes slightly asymmetric, often running down the petiole; flowers daisy-like or thistle-like; fruit with a tuft of bristles ..... **Asteraceae** (p. 1131)

94. a. Leaves varying from small and narrow to large and almost circular, up to 16 × 10 cm, lateral veins distinct; flowers with petals spreading, usually strap-shaped, white or greenish to cream, ageing to yellow; stamens joined to form a distinctive tube; fruit a woody capsule splitting into 5 valves; seeds partly or wholly covered by a brightly coloured aril ..... **Meliaceae** (p. 443)
b. Young branchlets with bark peeling and flaking off in rings and strips or with conspicuous leaf-scars, sometimes crater-like or purplish green; leaves with extra-floral nectaries on the blade, next to the midrib or on the petiole, more visible on young leaves, appearing as a thickening on older leaves; fruit with 2 wings appearing as 1 wing all the way around; branches horizontal giving a tiered or layered look ..... **Combretaceae** (p. 789)

95. a. Leaves with glands or extra-floral nectaries **96**
b. Leaves without glands **98**

96. a. Branches without conspicuous thick, woody tendrils, curving like a ram's horn **97**
b. Branches often with conspicuous thick, woody tendrils, curving like a ram's horn and occasionally forming a complete circle; fruit a fleshy drupe with the persistent calyx around the base, pendulous ..... **Linaceae** (p. 401)

97. a. Leaves with golden or translucent gland dots, without a gland on top of the midrib next to the petiole ..... **Euphorbiaceae** (p. 460)
b. Leaves with a distinctive yellowish or brownish dot or gland (extra-floral nectary) on top of the midrib next to the petiole; bark wrinkled where there is a bend in the trunk; fruit look like dry, star-like flowers ..... **Dipterocarpaceae** (p. 738)

98. a. Growing tip usually soft **99**
b. Leafy growing tip characteristically hard and stiff, distinctive; fruit fleshy, spherical to ovoid, usually with 3 seeds ..... **Euphorbiaceae** (p. 460)

99. a. Flower stalk separate from the petiole **100**
b. Flower stalk combines with the petiole so that the flowers and fruits appear to arise at the base of the leaf where it joins the petiole; stipules minute falling early ..... **Dichapetalaceae** (p. 460)

100. a. Leaves with the base more or less symmetric **101**
b. At least some leaves with an asymmetric base; fruit fleshy, 1-seeded .....
..... **Euphorbiaceae** (p. 460)

101. a. Plants with mustard oils and a faint smell of mustard when crushed, cream-coloured midrib prominent below, apex sometimes with a hair-like tip; with an occasional trifoliolate leaf; stipules bristle-like falling early; often with light-coloured bark; flowers a mass of stamens, ovary on a long stalk (gynophore) protruding; fruit on the end of the gynophore which often becomes stout and obvious ..... **Capparaceae** (p. 220)
b. Branches often angular or ridged, sometimes pinkish; stipules usually next to ridges on the stem, shrivelling or falling early; leaves often with lateral veins more visible above than below, margin sometimes rolled under; sometimes a yellow pigment visible on exposed underbark; fruit a 1- to 3-lobed capsule, with short horns in 1 genus ..... **Celastraceae** (p. 587)

(3) Leaves simple, spirally arranged

b. margin not entire

1. a. Stems and leaves without stinging hairs **2**
b. N.B. Stems and leaves with stinging hairs; leaves round to heart-shaped, look fleshy with little raised dots that bear the hairs; bark bronzy, or pinkish brown; contact with the stinging hairs causes intense irritation ..... **Urticaceae** (p. 154)

2. a. Plants without a milky or yellow sap **3**
b. Plants with a milky, yellow or watery sap **14**

3. a. Leaves with a single midrib, and the first 2 lateral veins do not start as a distinct pair right at the base **4**
b. Leaves with 3 or more veins from the base, or with the midrib and the first 2 lateral veins as a distinct pair at, or near, the base (most obvious on the undersurface) **15**

4. **a.** Plants unarmed **5**
b. Plants armed with spines **27**

5. **a.** Not associated with mangrove swamps **6**
b. Strictly coastal, associated with mangrove swamps, always near water; better adapted to equally marshy but less saline conditions, also occurring on sand dunes and river banks; fruit 1-seeded, dispersed by the sea **29**

6. **a.** Petiole present, sometimes very short but distinct **7**
b. Petiole absent, usually masked by the decurrent leaf base **30**

7. **a.** Undersurface of the leaves green, sometimes paler green, but not discolourous **8**
b. Undersurface of the leaves silvery or pale grey to whitish **33**

8. **a.** Leaves with a green-leaf smell when crushed **9**
b. Leaves aromatic when crushed **35**

9. **a.** Petioles green to yellowish, not pink- or purple-tinged **10**
b. Petioles with a purple or pink tinge, sometimes with a channel or groove along the top **36**

10. **a.** Petiole without a swelling or pulvinus just below the blade **11**
b. Petiole with a conspicuous swelling or pulvinus just below the blade **39**

11. **a.** Leaves without distinct to conspicuous parallel lateral veins or net-veining **12**
b. Leaves with distinct to conspicuous parallel lateral veins or net-veining **40**

12. **a.** Leaves more or less flat on top **13**
b. Leaves with lateral veins indented above, making them look puckered or quilted **42**

13. **a.** Leaves hairless, sometimes slightly velvety when young **45**
b. Leaves hairy or velvety **49**

14. **a.** Leaves often 3-veined from the base; stipules frequently conspicuous, enveloping the leaf bud, but falling as soon as the leaves unfold, to leave a conspicuous scar around the stem; petiole stops at the midrib and look as though it has been stuck on below; bear figs or fig-like fruit .....**Moraceae** (p. 129)
b. Leaves single-veined from the base; without a stipular scar around the stem .... **Euphorbiaceae** (p. 460)

15. **a.** Leaves with more than 3 veins from the base **16**
b. Leaves with only 3 veins, or with a midrib and 1 distinct pair of lateral veins (or sometimes a faint second pair) at the base **19**

16. **a.** Leaves almost circular **17**
b. Leaves ovate to almost round with a lobed base **21**

17. **a.** Apex and margin of the leaves with lobes **18**
b. Apex and margin of the leaves without lobes (ignore base, which may or may not be lobed) **24**

18. **a.** Leaves with distinct lobes **22**
b. Leaves with numerous slight lobes **26**

19. a. Leaves not discolourous; stems with stipules and/or stipular scars (often 'stipules fall early' so look at new and young growth) **20**
b. Leaves pale grey to whitish below, base tapering down the petiole; stipules absent; flowers thistle-like ..... **Asteraceae** (p. 1131)

20. a. Leaves often with a pair of glands looking like a small bee's sting at or near the junction with the petiole; fruit a 3-lobed capsule, drupe or berry crowned with 3 persistent stigmas .... **Euphorbiaceae** (p. 460)
b. Leaves stiffly leathery, margin with teeth often gland-tipped; armed or unarmed; fruit fleshy ..... **Flacourtiaceae** (p. 746)

21. a. Leaves with base lobed; margin jaggedly toothed, slightly to markedly 3-lobed; fruit a small dehiscent capsule, surrounded by the dry, papery, persistent petals ..... **Sterculiaceae** (p. 707)
b. Leaves with base tapering to rounded; margin shallowly toothed or scalloped; fruit a dehiscent capsule, splitting into 3 sections; occurring on coastal dunes and in littoral scrub .... **Rhamnaceae** (p. 664)

22. a. Branches without prickles **23**
b. Young branches hairy and densely covered with prickles; leaves with 3–7 distinct lobes, and a gland near the base of the midrib; fruit a capsule ..... **Malvaceae** (p. 701)

23. a. Leaves palmately lobed; either deeply divided that it almost appears digitate with margin bluntly toothed and fruit fleshy, almost round or laterally compressed; or shallowly lobed, margin with teeth ending in glandular hairs to give a shaggy appearance and fruit elliptic, flattened, almost winged ..... **Araliaceae** (p. 844)
b. Leaves slightly to markedly 3-lobed; fruit a small dehiscent capsule, surrounded by the dry, papery, persistent petals ..... **Sterculiaceae** (p. 707)

24. a. A tree or a shrub **25**
b. Usually a woody climber or a liane ..... **Vitaceae** (p. 676)

25. a. Leaves without a gland on the veins on the undersurface **26**
b. Leaves with a distinctive mark, an elongate slit or gland (extra-floral nectary), on 1 or more of the veins on the undersurface; fruit a capsule ..... **Malvaceae** (p. 701)

26. a. Leaves with margin broadly scalloped or toothed to slightly lobed; showy, red, bell-shaped, about 2 cm long, the red stamens and style protruding from the mouth of the petal tube ..... **Greyiaceae** (p. 662)
b. Leaves with margin finely to bluntly toothed; stipules sometimes leaf-like, falling very early; fruit a small 3-valved capsule opening at the tip; seeds 1 or 2, with a bright orange or red aril ..... **Flacourtiaceae** (p. 746)

27. a. Leaf margin with teeth often gland-tipped **28**
b. Leaf margin with teeth not gland-tipped; bark often peeling or flaking, resinous; fruit thinly fleshy, splitting into 2 sections which fall away to reveal a single black stone, with a pseudo-aril, often brightly coloured, clasping the base ..... **Burseraceae** (p. 425)

28. a. Branches usually round; leaves sometimes obscurely 3- to 7-veined from the base; stipules and/or stipular scars present (often 'stipules fall early' so look at new and young growth); fruit fleshy ..... **Flacourtiaceae** (p. 746)
b. Branches often angular or ridged; stipules next to ridges on the stem, shrivelling early; often a yellow pigment visible on exposed underbark; fruit a capsule or a drupe .... **Celastraceae** (p. 587)

29. a. Leaves shorter than 10 cm, petiole absent; supported by buttress and stilt roots; fruit ovoid to oblong, tipped with the persistent calyx, style and stigma, woody ... **Combretaceae** (p. 789)
b. Leaves large, longer than 10 cm, petiole very short, purple; fruit dangling on long stalks, conical to ovoid, crowned by the remains of the persistent calyx and style, fleshy at first, becoming hard, fibrous to give it buoyancy in water ..... **Lecythidaceae** (p. 782)

30. a. Leaves with teeth around the margin **31**
b. Leaves with 3–10 large glandular teeth around the apex; flowers in the leaf axils in roundish, pincushion-like heads ..... **Proteaceae** (p. 156)

31. a. Leaves longer than 2,5 cm, without gland-dots **32**
b. Leaves shorter than 2,5 cm, with conspicuous gland-dots particularly below .... **Myricaceae** (p. 122)

32. a. Leaves with lateral veins very distinct; sometimes with 2 lobes giving a 3-lobed effect; flowers thistle-like; fruit a small nutlet, with an apical tuft of hairs ..... **Asteraceae** (p. 1131)

b. Leaves almost triangular, clasping the base; veining almost parallel; fruit a small, hard nut embedded in the dry remains of the old flowers ..... **Rosaceae** (p. 245)

33. a. Leaves long and narrow, usually at least 3–4 or more times as long as wide; fruit woolly **34**
b. Leaves elliptic to obovate, less than 3 times as long as wide, base tapering down the petiole; flowers thistle-like, in small heads, in axillary and terminal sprays ..... **Asteraceae** (p. 1131)

34. a. Stems and petioles reddish; with a green-leaf smell when crushed; strictly riverine .... **Salicaceae** (p. 120)
b. Leaves aromatic and smelling of camphor when crushed; flowers thistle-like; fruit a small nutlet, densely woolly without an apical tuft of hairs ..... **Asteraceae** (p. 1131)

35. a. Leaves sometimes with minute yellowish glands below; flowers and fruits in spikes; fruit small drupes often waxy ..... **Myricaceae** (p. 122)
b. Petiole pink, leaf margin with 1 or 2 glandular dots between the teeth near the base; crushed leaves, fruit and bark with a faint smell of almonds; fruit a drupe, red to purplish brown..... ..... **Rosaceae** (p. 245)

36. a. Young branches reddish tinged with purple **37**
b. Young branches dark or purplish brown, sometimes with conspicuous pale lenticels; leaves leathery; fruit a 2- to 5-valved capsule or a fleshy berry with persistent styles often set asymmetrically, even well down 1 side of the fruit ..... **Flacourtiaceae** (p. 746)

37. a. Leaves without glands near the base, do not smell of almonds when crushed **38**
b. Leaf margin with teeth gland-tipped, with 2 or more glands near the base; crushed leaves fruit and bark with a faint smell of almonds; fruit a drupe, red to purplish brown .... **Rosaceae** (p. 245)

38. a. Leaves with apex tapering to a point, margin can have sharp teeth, but sometimes they are difficult to find, pale patches seen when the leaves are held up to the light; stipules minute semi-persistent; fruit a small shiny crimson berry ..... **Aquifoliaceae** (p. 587)
b. Branchlets purplish red, stipules small, gland-like, green, on the smooth reddish shoots; fruit a dehiscent capsule with a flat tip; usually at high altitudes, in open scrub near streams ..... **Rhamnaceae** (p. 664)

39. a. Leaves with a few scattered glands on the undersurface; young leaves bright red; fruit a conspicuously 2- to 3-lobed, dehiscent capsule ..... **Euphorbiaceae** (p. 460)
b. Bark usually flaking; stipules inconspicuous; fruit 3 or 4 leathery or woody follicular carpels, splitting longitudinally ..... **Sterculiaceae** (p. 707)

40. a. Leaves with midrib flat or indented above, lateral veins, if visible, more ridged below than above **41**
b. Leaves with midrib ridged above as well as below, numerous fine lateral veins, usually visible above, may or may not be visible below; fruit thinly fleshy drupelets, joined to the swollen receptacle and surrounded by pink to red enlarged petal-like sepals .... **Ochnaceae** (p. 720)

41. a. Most lateral veins branching and forming a 'Y' just before the margin; fruit a velvety capsule, splitting to reveal the bright red, semi-fleshy aril which covers the seed ..... **Sapindaceae** (p. 638)
b. Lateral veins sometimes branching and forming a 'Y' just before the margin; flowers in very dense, branched, woody, persistent, antler-like structures formed from bracts, resembling a parasitised deformity ..... **Anacardiaceae** (p. 538)

42. a. Leaves with lateral veins not pinched into the midrib, teeth not gland-tipped **44**
b. Leaves shiny, with domatia, looking as though the veins have been pinched into the midrib like a tuck; puckered towards the base as though the veins are too tight for the leaf, teeth gland-tipped **43**

43. a. Leaves very shiny, sometimes curling backwards, stems with big and little leaves; fruit a fleshy berry ..... **Rhamnaceae** (p. 664)
b. Leaves shiny, fruit a finely velvety 2-lobed capsule ..... **Escalloniaceae** (p. 240)

44. a. Leaves with base tapering down the petiole; flowers thistle-like or daisy-like; fruit a small nutlet, with an apical tuft of hairs ..... **Asteraceae** (p. 1131)
b. Leaves gland-dotted, base tapering to the petiole; petioles quite long; often with flowers or fruits, both white ..... **Maesaceae** (p. 866)

45. a. Leaves 3–4 times or more as long as broad **46**
b. Leaves less than 3 times as long as broad **47**

46. a. Stems with a slender stipular scar more or less all the way around; stipules usually present, sometimes persisting and quite conspicuous; fruit a dehiscent capsule ... **Violaceae** (p. 742)
b. Stipules absent; fruit fleshy, calyx persistent ..... **Ericaceae** (p. 859)

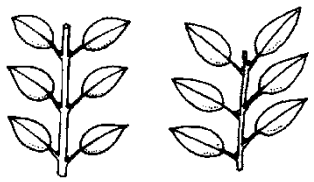
47. a. Leaves with the teeth around the margin not gland-tipped, sometimes with dry brown ends **49**
b. Leaves stiffly leathery, with the teeth around the margin gland-tipped **48**

48. a. Leaves with lateral veins sometimes more visible above than below; branches often angular or ridged; often a yellow pigment visible on exposed underbark; fruit a capsule or a drupe... ..... **Celastraceae** (p. 587)
b. Branches usually round; fruit fleshy ..... **Flacourtiaceae** (p. 746)

49. a. Leaves often rough or harsh to the touch, sometimes smooth; stipules absent; branchlets round; fruit a fleshy drupe partially or completely surrounded by the persistent calyx..... ..... **Boraginaceae** (p. 965)
b. Leaves leathery or succulent with base tapering down the petiole; flowers thistle-like or daisy-like; fruit a small nutlet, with an apical tuft of hairs ..... **Asteraceae** (p. 1131)

(4) Leaves simple, opposite or sub-opposite

a. margin entire



1. **a.** Plants without a milky or yellow sap **2**
b. Plants with a milky, yellow or resinous sap **25**

2. **a.** Leaves with a single midrib and the first 2 lateral veins do not start as a distinct pair right at the base **3**
b. Leaves with 3 or more veins from the base or near the base **30**

3. **a.** Plants unarmed **4**
b. Plants armed with spines **33**

4. **a.** Not associated with mangrove swamps **5**
b. Strictly coastal, constituents of mangrove swamps, always near water **40**

5. **a.** Leaves with lateral veins visible even if only slightly so **6**
b. Leaves with a midrib and without lateral veins ..... **Podocarpaceae** (p. 87)

6. **a.** Petiole present, sometimes very short but distinct **7**
b. Petiole absent **42**

7. **a.** Undersurface of the leaves green, sometimes paler green but not discolourous **8**
b. Undersurface of the leaves pale grey to whitish, silvery or golden brown **45**

8. **a.** Leaves not aromatic, with a green-leaf smell when crushed **9**
b. Leaves aromatic or pungent when crushed **50**

9. **a.** Stems with or without a horizontal ridge between the opposite petioles, if present without stipules **10**
b. Stems with a horizontal ridge between the opposite petioles with a stipule on each side (stipules fall often early so look at the new growth) **54**

10. **a.** Leaves without distinct to conspicuous parallel lateral veins or net-veining **11**
b. Leaves with distinct to conspicuous parallel lateral veins or net-veining **55**

11. **a.** Petiole stops at the stem, not running down to form ridges **12**
b. Petiole running down onto the stem to form ridges **62**

12. **a.** Branchlets usually round **13**
b. Young branches often flattened, ridged or angular, sometimes distinctly 4-angled **63**

13. **a.** Leaves with lateral veins not curling around and going towards the apex parallel to the midrib **14**
b. Leaves with lateral veins opposite to sub-opposite, curling around and going towards the apex parallel to the midrib; occurring in high-altitude rainforest, where the light green leaves are conspicuous against the dark green of the forest background ..... **Cornaceae** (p. 858)

14. a. Leaves in the pair more or less the same size **15**
b. Leaves in the pair sometimes slightly to markedly different in size; stems with swollen nodes and often slightly swollen just above the nodes; flowers 2-lipped subtended by conspicuous bracts sometimes almost concealed by them; fruit a dehiscent capsule ..... **Acanthaceae** (p. 1016)

15. a. Bark not particularly tough and fibrous **16**
b. Bark thin, fibrous and very tough, stripping off in long pieces rather than breaking; branches flattened at the nodes or with a distinctive branching pattern with 2 or 3 buds per axil; fruit a small nut enclosed in the persistent calyx tube ..... **Thymelaeaceae** (p. 775)

16. a. Leaves with lateral veins that may or may not be visible, if visible they are not ridged, or only slightly so **20**
b. Leaves with lateral veins distinct, ridged, particularly below **17**
17. a. Leaves mostly shorter than 15–18 cm **18**
b. Leaves very large, obovate-oblong, 15–40 cm long or more; fruit a berry with a leathery skin and numerous tiny seeds; trees with a straight clean bole and comparatively short branches high up ..... **Gentianaceae** (p. 932)

18. a. New stems and leaves not reddish; hairs not stellate **19**
b. Leaves shiny green above, paler below, about 4 or more time as long as wide, new stems and new leaves reddish, hairy with stellate hairs; flowers cream or yellowish green, in rather ragged, spiky heads; fruit a small, hairy capsule ..... **Hamamelidaceae** (p. 245)

19. a. Leaves hairy or hairless; bark on twigs stringy, peeling off in small strips; fruit a samara, usually 4-winged (sometimes 5 or 6), mostly broadly ellipsoid to round in outline, indehiscent ..... **Combretaceae** (p. 789)
b. Leaves velvety particularly when young and along the veins on the undersurface, lateral veins and net-veining indented above to give a quilted effect; bark scaly grey outside, yellowish underneath; fruit a woody, pear-shaped capsule, splitting longitudinally into 2 valves (somewhat resembling the open mouth of a hippo) ..... **Oleaceae** (p. 912)

20. a. Leaves hairless **21**
b. Leaves hairy when young and often on the undersurface when mature, flat or arched along the midrib with the 2 halves somewhat roundly folded together, stems sometimes with conspicuous little pink conical buds in the axils of the petioles or leaf scars; fruit with 2–4 wings (rarely 5), base of the wings tapering and running into the stalk .... **Combretaceae** (p. 789)

21. a. Leaves not particularly succulent, not crackling when crushed **22**
b. Leaves rather succulent when young but becoming leathery, crackling when crushed; fruit a round, thinly fleshy drupe; plants often emit an unpleasant odour ..... **Salvadoraceae** (p. 920)

22. a. Leaves without domatia or if present, inconspicuous **23**
b. Leaves stiff leathery, with conspicuous domatia, hairless; young branchlets often with lenticels; fruit a thinly fleshy drupe, 1-seeded ..... **Oleaceae** (p. 912)

23. a. Leaves mostly opposite to sub-opposite particularly on flowering branches, sometimes alternate or spirally arranged on long shoots and coppice growth; fruit a berry **24**
b. Leaves stiffly leathery, surface with or without minute scales resembling pits; lateral veins somewhat obscure; fruit a thinly fleshy drupe ..... **Oleaceae** (p. 912)

24. a. Leaves leathery, margin slightly to markedly wavy; often look dirty; all young parts with a granular rust-coloured exudate; stipules absent; fruit usually 1-seeded ..... **Ebenaceae** (p. 885)
b. Leaves thick hard and leathery; fruit 2- to 4-seeded ..... **Celastraceae** (p. 587)

25. a. Sap milky or watery **26**
b. Sap yellow, orange or resinous; leaves leathery narrowly to somewhat broadly elliptic; fruit a large berry, 1,5–2,5 cm long; or leaves with translucent glands or streaks and petiole absent; flowers showy, yellow ..... **Clusiaceae** (p. 733)

26. a. Leaves with lateral veins not numerous and close together **27**
b. Leaves with lateral veins numerous, close together, may or may not divide just before reaching the margin; fruit kidney-shaped usually smaller than 1,5 cm long or in diameter .... **Anacardiaceae** (p. 538)

27. a. Stipules absent or inconspicuous, falling early **29**
b. Stipules frequently conspicuous **28**

28. a. Stems with a horizontal ridge between the petioles with a stipule on each side; fruit fleshy crowned with the remains of the persistent calyx or calyx scar ..... **Rubiaceae** (p. 1021)
b. Stipules enveloping the leaf bud, but usually falling early, to leave a conspicuous scar around the stem; petiole stops at the midrib and look as though it has been stuck on below; fruit fig-like ..... **Moraceae** (p. 129)

29. a. Leaves leathery, shiny green; fruit twin berries or paired dry follicles, sometimes only 1 by abortion ..... **Apocynaceae** (p. 941)
b. Pairs of deep coppery-red, young leaves stand erect at the end of the branches; fruit a dehiscent capsule ..... **Euphorbiaceae** (p. 460)

30. a. Leaves in the pair the same size **31**
b. One leaf in the pair usually markedly smaller than the other ..... **Euphorbiaceae** (p. 460)

31. a. Leaves 3-veined right from the base **32**
b. Leaves look as though the petiole runs into the leaf and then divides into 3 veins; fruit an almost round berry, fleshy or with a thickly woody shell ..... **Strychnaceae** (p. 923)

32. a. Young branches 4-angled, with thickened swellings at the nodes; fruit a fleshy berry, crowned with the persistent calyx ..... **Melastomataceae** (p. 842)
b. A scandent shrub or liane up to 6 m in height, climbing by means of spine-like persistent petioles; fruit a slightly 4-lobed drupe ..... **Lamiaceae** (p. 976)

33. a. Spines straight at least when mature **35**
b. Spines curved, usually in pairs **34**

34. a. Leaves with a single midrib **39**
b. Leaves look as though the petiole runs into the leaf and then divides into 3 veins; fruit an almost round berry, fleshy or with a thickly woody shell ..... **Strychnaceae** (p. 921)

35. a. Spines single or in pairs **36**
b. Spines in a whorl of 4 at each pair of leaves, 1 or more sometimes developing into a branch; fruit a round berry with a sharply pointed tip ..... **Salvadoraceae** (p. 920)

36. a. Spines, spine-tipped branchlets single and/or in pairs; when in pairs, not usually at right angles to each other, but if they are, there is no ridge between them **37**
b. Branchlets and spines decussate and with a horizontal ridge on the stem between the opposite spines, spines and branchlets sometimes in whorls of 3 ..... **Rubiaceae** (p. 1021)

37. a. Scrambling shrubs or woody climbers with long trailing branches, or lianes reaching the canopy; sometimes small trees **38**
b. Distinctly trees; leaves on short, decussate, often spine-tipped twigs, and spread out, grey-green, giving the tree a characteristic greyish appearance; fruit a very small, 4-winged samara ..... **Combretaceae** (p. 789)

38. a. Spines axillary; leaves usually opposite on all branches **39**
b. Spines formed by the remains of persistent petioles; leaves opposite on flowering branches, spiralled on vegetative branches; fruit a 4- to 5-winged samara ..... **Combretaceae** (p. 789)

39. a. Branchlets angular usually in the same plane, with strongly hooked spines, usually in pairs; fruit a fleshy drupe ..... **Rhamnaceae** (p. 664)
b. Leaves between paired spines which are sharp and downward hooked, straight on mature stems; branchlets at right angles; fruit enclosed in the hardened perianth ..... **Nyctaginaceae** (p. 199)

40. a. Trees with an extensive underground root system that produces a forest of finger-like or pencil-like roots or pneumatophores sticking out of the mud; seed not producing a hypocotyl **41**
b. Trees with strangely shaped roots above ground, elbow-angled or stilt-roots or buttress-roots; seed germinating while still on the tree producing a torpedo-shaped hypocotyl..... **Rhizophoraceae** (p. 783)

41. a. Pneumatophores pencil-like; undersurface of leaves with specialised glands which excrete a salt solution (droplets can sometimes be seen in the early morning), salty to the tongue; fruit an ovoid, 2-valved capsule with a pointed tip, pale green, velvety; common and often dominant in mangrove swamps, but also occurring away from the sea ... **Avicenniaceae** (p. 975)
b. Pneumatophores finger-like; often growing in shallow sea water as well as in deep mud; fruit a many-seeded berry tipped with the remains of the persistent style and the persistent calyx at the base, rotting in the water to release the seed ..... **Sonneratiaceae** (p. 781)

42. a. Leaves without numerous fine parallel lateral veins **43**
b. Leaves leathery, with numerous fine parallel lateral veins joining up to form a sub-marginal vein, aromatic when crushed; fruit a 1-seeded fleshy berry ..... **Myrtaceae** (p. 824)

43. a. Leaves without translucent gland-dots or streaks **44**
b. Leaves with translucent gland-dots or streaks; flowers showy, yellow; fruit a small dehiscent capsule ..... **Clusiaceae** (p. 733)

44. a. Stems with a horizontal ridge between the petioles with a stipule on each side; fruit crowned with the remains of the persistent calyx, or calyx scar ..... **Rubiaceae** (p. 1021)
b. Branches often 4-angled, angular or ridged; stipules absent ..... **Scrophulariaceae** (p. 1001)

45. a. Undersurface of the leaves silvery to golden brown or with rusty-coloured hairs **47**
b. Undersurface of the leaves silvery, pale grey to whitish **46**

46. a. Stipules if present or distinctive not standing upright; leaves often with midrib and lateral veins indented above to give a wrinkled or puckered appearance; flowers white to cream or lilac to purple in conspicuous terminal sprays, sweetly scented; fruit a small capsule protruding for about half its length beyond the persistent calyx ..... **Buddlejaceae** (p. 933)
b. Stipules distinctive, ensheathing the growing tip but, as the shoot thrusts through, opening out and standing side by side like a pair of wings, falling quite early ..... **Euphorbiaceae** (p. 460)

47. a. Leaves with hairs, not scales **48**
b. Leaves stiff, undersurface densely covered with small silvery, golden or brown scales (10x lens), giving a brownish colour and sheen to the leaves, midrib indented above, apex sharp-tipped, almost bent backwards; fruit a thinly fleshy drupe, 1-seeded ..... **Oleaceae** (p. 912)

48. a. Leaves with dense rusty or chocolate-brown hairs below; stems round **49**
b. Leaves creamy brown below; stems 4-angled; flowers yellow, tinged with red in the throat, 1–1,5 cm long, in small axillary clusters ..... **Scrophulariaceae** (p. 1001)

49. a. Leaves softly textured with dense rusty hairs especially below, tiny black spots seen around the apex when held up to the light; bark corky, flaking off to reveal a rusty underbark; fruit small, fleshy, red ..... **Clusiaceae** (p. 733)
b. Leaves with chocolate-brown velvety hairs below; new leaves with conspicuous reddish brown velvety hairs; flowers cream or yellowish green, in rather ragged, spiky heads; fruit a small, hairy capsule ..... **Hamamelidaceae** (p. 245)

50. a. Leaves with a fresh or pleasant smell when crushed **51**
b. Leaves with an unpleasant smell when crushed; fruit a small drupe ..... **Lamiaceae** (p. 976)

51. a. Leaves with lateral veins almost reaching the margin, joining up to form a sub-marginal vein, fruit a 1-seeded fleshy berry; inflorescence often becomes characteristically galled **53**
b. Leaves shiny green without a sub-marginal vein **52**

52. a. Leaves with translucent gland dots visible (10x lens); flowers large, showy, pink to mauve; fruit a rough, warty capsule up to 3,5 cm in diameter ..... **Rutaceae** (p. 408)
b. Leaves without gland dots visible; usually with some russet-coloured leaves, often with characteristic little round galls; fruit completely enclosed in the enlarged perianth tube .... **Lauraceae** (p. 213)

53. a. Young stems often 4-angled, fruit a 1-seeded fleshy berry ..... **Myrtaceae** (p. 824)
b. Stems flattened at the nodes, leaves with midrib reddish, indented above, prominent below, margin rolled under; confined to the Natal Group Sandstone of KwaZulu-Natal and the Eastern Cape; fruit a 2-lobed flattened capsule splitting at the top to open like a purse; seeds wind-borne ..... **Rhynchocalycaceae** (p. 781)

54. a. Leaves with margin entire, although very rarely it is wavy to slightly crisped and so appearing slightly indented; domatia often in the axils of lateral veins and the midrib; fruit a drupe, berry, or capsule crowned with the remains of the persistent calyx, or scar ... **Rubiaceae** (p. 1021)
b. Leaves with margin usually serrated at least towards the apex, entire towards the base; when entire often mangroves; fruit a capsule, sharply tipped with the remains of the old style and with the persistent sepals around the base ..... **Rhizophoraceae** (p. 783)

55. a. Leaves without hairs, sometimes sparsely hairy or slightly hairy when young **56**
b. Leaves hairy or velvety on 1 or both surfaces, lateral veins close together, may or may not divide just before reaching the margin; fruit a kidney-shaped drupe ..... **Anacardiaceae** (p. 538)

56. a. Leaves usually all green, not coloured **57**
b. Occasional brightly coloured red, orange or yellow leaves scattered throughout the crown; fruit asymmetrically oblong, fleshy, up to 1,2 cm long ..... **Anacardiaceae** (p. 538)

57. a. Branchlets usually round **61**
b. Young branches often flattened, ridged or angular, sometimes distinctly 4-angled **58**

58. a. Leaves without a gland terminating the midrib before the apex ***59***
b. Leaves leathery, with a conspicuous gland terminating the midrib before the apex, visible on the undersurface and often above as well; fruit a small capsule, often in dense clusters ..... **Lythraceae** (p. 780)

59. a. Leaves without a sub-marginal vein ***60***
b. Leaves with lateral veins going to the margin, joining up and forming a sub-marginal vein; fruit a 1-seeded fleshy berry ..... **Myrtaceae** (p. 824)

60. a. Petioles usually greenish to yellowish; leaves drooping; often a yellow pigment visible on exposed bark; fruit nut-like or a berry ..... **Celastraceae** (p. 587)
b. Young branchlets sometimes pinkish, petioles often pink to purplish; leaves with a faint smell of almonds when crushed; fruit a drupe, dry or thinly fleshy, with a circular scar at the apex ..... **Oliniaceae** (p. 771)

61. a. Most leaves shorter than 11 cm, lateral veins going straight to the margin and forming a distinct herring-bone pattern; fruit a drupe ..... **Rhamnaceae** (p. 664)
b. Leaves large, 14–25 cm long, net-veining parallel between the lateral veins; flowers dull red to crimson or maroon, in spikes at the swollen nodes in the axils of the fallen leaves on the upper parts of the branches; fruit an obovoid to oblong, woody, beaked capsule ..... **Acanthaceae** (p. 1016)

62. a. Leaves blue-green with a grey bloom, margin edged with yellow, tightly rolled under; petiole short, thickset, about 2 mm long; fruit a drupe, crowned with the remains of the persistent calyx ..... **Santalaceae** (p. 194)
b. Leaves shiny green above; new leaves red; fruit a berry, 1,5–2 cm long ..... **Clusiaceae** (p. 733)

63. a. Young branches not really sticky, leaves usually wider than 1 cm ***64***
b. Branches sticky when young; leaves narrow, no more than 1 cm wide; fruit an ovoid, 2-lobed, dehiscent capsule ..... **Scrophulariaceae** (p. 1001)

64. a. Branches not bright green; very young leaves and shoots distinctly pink, reddish or bronze, or purplish; leaves with lateral veins looping and joining up before the margin to more or less form a sub-marginal vein; fruit a fleshy berry tipped with the remains of the persistent calyx ***67***
b. Young branches bright green; new shoots not pink to reddish ***65***

65. a. Leaves mostly opposite to sub-opposite ***66***
b. Leaves usually opposite on flowering branches, alternate or spirally arranged on young branches, thick hard and leathery ..... **Celastraceae** (p. 587)

66. a. Leaves about twice as long as wide; fruit a brown capsule about 7 mm in diameter, crowned with 3 conspicuous horns which are the hardened remains of the persistent styles, dehiscent ..... **Buxaceae** (p. 536)
b. Leaves with length less than twice the width; branches become long and straggling; leaves shiny green, midrib indented above; fruit an elongate, rather narrow, drupe, longitudinally ridged ..... **Icacinaceae** (p. 635)

67. a. Leaves with numerous lateral veins, very close together, seldom more than 5 mm apart; sometimes gland-dotted (10x lens) ..... **Myrtaceae** (p. 824)
b. Leaves with lateral veins more than 5 mm apart, not gland-dotted ..... **Melastomataceae** (p. 842)

(4) Leaves simple, opposite or sub-opposite

b. margin not entire

1. a. Plants without a milky or watery sap **2**
b. Plants with a white milky or watery sap; fruit a single berry, twin berries or paired dry follicles, sometimes only 1 by abortion ..... **Apocynaceae** (p. 941)

2. a. Stipules if present not interpetiolar **3**
b. Interpetiolar stipules present, stems with a horizontal ridge between the opposite petioles **14**

3. a. Leaves in the pair more or less the same size **4**
b. Leaves in the pair slightly to markedly different in size **16**

4. a. Leaves with a single midrib and the first 2 lateral veins do not start as a distinct pair right at the base **5**
b. Leaves with 3 or more veins from the base or near the base **17**

5. a. Plants unarmed **6**
b. Plants armed with spines or prickles **18**

6. a. Usually distinctly a tree or shrub; leaves mostly opposite **7**
b. Scrambling shrubs or woody climbers, or lianes reaching the canopy, sometimes climbing by means of hooked side branchlets; can become small trees; leaves opposite to sub-opposite on the flowering shoots, sometimes alternate or spirally arranged on vegetative branches; fruit a capsule or a berry ..... **Celastraceae** (p. 587)

7. a. Leaves with a green-leaf smell when crushed **8**
b. Leaves aromatic or pungent when crushed **19**

8. a. Leaves green, sometimes paler green below but not discolourous **9**
b. Leaves grey to silvery or whitish on 1 or both surfaces **21**

9. a. Branches usually round **10**
b. Branches often 4-angled, angular or ridged **23**

10. a. Leaves with apex and margin not spine-tipped **11**
b. Leaves succulent, with or without a dense covering of cobweb-like hairs, apex and teeth around the margin spine-tipped; flowers daisy-like ..... **Asteraceae** (p. 1131)

11. a. Mature leaves hairless, sometimes finely hairy when young **12**
b. Leaf buds and young leaves with dense woolly, grey or rusty hairs; leaves shiny dark green, hairless, with conspicuous pale veins above, undersurface light green with woolly hairs and very prominent veins with short soft grey, rusty or brown hairs, margin with teeth often curving backwards, particularly on young leaves and coppice growth; fruit a fleshy drupe ..... **Cornaceae** (p. 858)

12. a. Branchlets and petioles not reddish **13**
b. Branchlets and petioles reddish; fruit a round, 2-valved capsule, tapering to a sharp point, dark brown tinged with red, with the remains of the persistent sepals and petals around the base, dehiscent ..... **Flacourtiaceae** (p. 746)

13. a. Leaves about twice as long as wide with lateral veins going straight to the margin, forming a distinct herring-bone pattern, margin finely scalloped between the lateral veins; fruit a fleshy drupe ..... **Rhamnaceae** (p. 664)
b. Leaves long and narrow, 4–8 times as long as wide, strictly riverine . **Buddlejaceae** (p. 933)

14. a. Teeth on the margin not gland-tipped **15**
b. Leaf margin evenly toothed, each tooth minutely gland-tipped; often a yellow pigment visible on exposed underbark; fruit a dry, dehiscent capsule, more or less narrowly oblong, with 1–4 seeds ..... **Celastraceae** (p. 587)

15. a. Leaf margin scalloped to finely toothed; stipules large, falling early; fruit an obscurely 3-lobed capsule, almost spherical, reluctantly dehiscent; 3-seeded ..... **Rhamnaceae** (p. 664)
b. Leaf margin usually serrated, at least towards the apex, sometimes entire towards the base; fruit a capsule, sharply tipped with the remains of the old style and with the persistent sepals around the base; fleshy at first but splitting later; 1-seeded, seeds dark brown to black, with a coloured aril ..... **Rhizophoraceae** (p. 783)

16. a. Leaves single-veined from the base; stems with swollen nodes and also often slightly swollen just above the nodes; fruit a dehiscent capsule ..... **Acanthaceae** (p. 1016)
b. Leaves 3-veined from the base with 4 little glands next to the petiole, stipules small falling early; fruit a deeply 3-lobed capsule ..... **Euphorbiaceae** (p. 460)

17. a. Leaves look as though the petiole runs into the leaf and then divides into 3 veins; fruit an almost round berry, fleshy or with a thickly woody shell ..... **Strychnaceae** (p. 921)
b. A scandent shrub or liane up to 6 m in height, climbing by means of spine-like persistent petioles; fruit a slightly 4-lobed drupe ..... **Lamiaceae** (p. 976)

18. a. Plants with long, straggling green branches; spines only on 1 side of the stem, between the petioles of the opposite leaves; fruit an elongate, rather narrow, drupe, longitudinally ridged ..... **Icacinaceae** (p. 635)
b. Leaves softly and finely hairy below; calyx forming a large, distinctive, papery saucer-shaped structure 2–4 cm in diameter ..... **Lamiaceae** (p. 976)

19. a. Leaves smell pleasant when crushed **20**
b. Leaves with an unpleasant smell when crushed; margin entire or not entire; fruit a small drupe ..... **Lamiaceae** (p. 976)

20. a. Leaves not always opposite, sometimes sub-opposite or very occasionally alternate, midrib and lateral veins indented above to give the leaf a very characteristic quilted appearance, translucent gland dots seen when held against a strong light; bark greenish, flakes off, sometimes marked with concentric rings and whirls ..... **Monimiaceae** (p. 212)
b. Leaves opposite or in whorls of 3, thinly textured, rough, hairy, net-veining distinct, indented above; fruit a drupe with a dry skin in oblong spikes ..... **Verbenaceae** (p. 976)

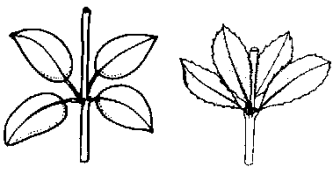
21. a. Leaves longer than 2,5 cm, ovate, elliptic to obovate or oblong **22**
b. Leaves small, almost circular, up to 2,5 χ 2,3 cm, veining conspicuous and distinctive below, seeming to fan out from the base and along the midrib to give the leaf a shell-like appearance; fruit 4 small nutlets, enclosed in the dry and scarcely enlarged papery remains of the calyx; endemic to the Chimanimani Mountains ..... **Lamiaceae** (p. 976)

22. a. Leaves pale grey to whitish below; flowers white to cream or lilac to purple in conspicuous terminal sprays, sweetly scented; fruit a small capsule protruding for about half its length beyond the persistent calyx ..... **Buddlejaceae** (p. 933)
b. Leaves greyish green, smooth to rough or harsh to the touch; irregularly and rather widely toothed around the upper half; fruit a fleshy drupe partially or completely surrounded by the persistent calyx ..... **Boraginaceae** (p. 965)

23. a. Leaves with lateral veins sometimes more visible above than below; apex sometimes hooked downwards; often a yellow pigment visible on exposed underbark; fruit a capsule or a drupe..... ..... **Celastraceae** (p. 587)
b. Leaves with lateral veins more visible below than above, apex tapering but not hooked downwards; flowers tubular, sometimes in clusters on the old wood, sometimes in small axillary clusters hidden among the leaves; fruit fleshy, black, crowned with the long thread of the persistent style, forming a tail-like wisp or an ovoid, 2-lobed, dehiscent capsule .... **Scrophulariaceae** (p. 1001)

(5) Leaves simple, whorled

margin entire or margin not entire



1. a. Plants without a milky, yellow or watery sap **2**
b. Plants with a milky, yellow or watery sap **13**

2. a. Undersurface of the leaves green, sometimes paler green but not discolourous **3**
b. Undersurface of the leaves silvery, pale grey to whitish or golden brown **15**

3. a. Leaves distinctly in whorls **4**
b. Leaves in whorls, but also opposite to sub-opposite or alternate to spirally arranged on the same tree.....**18**

4. a. Stipules if present not interpetiolar **5**
b. Interpetiolar stipules present **19**

5. a. Leaves with lateral veins that may or may not be visible, if visible they are not ridged or only slightly so **6**
b. Leaves with lateral veins prominent, usually form ridges, particularly on the undersurface; bark on twigs stringy, peeling off in small strips; fruit a samara, usually 4-winged (sometimes 5 or 6), mostly broadly ellipsoid to round in outline, indehiscent ..... **Combretaceae** (p. 789)

6. a. Leaves with lateral veins visible even if only slightly so **7**
b. Leaves without lateral veins ..... **Podocarpaceae** (p. 87)

7. a. Leaves with lateral veins not joining up to form a sub-marginal vein **8**
b. Leaves with lateral veins almost reaching the margin, looping and joining up to more or less form a sub-marginal vein **20**

8. a. Leaves with a green-leaf smell when crushed **9**
b. Leaves aromatic or pungent when crushed **21**

9. a. Leaves with length about twice the width, sometimes slightly longer **12**
b. Leaves long and narrow, 4 or more times as long as wide **10**

10. a. Leaves in whorls of 3 or 4; petiole reddish or purplish **11**
b. Leaves in whorls of 6 (occasionally 4–9) giving a 'star' appearance, margin irregularly and sharply toothed; young leaves rusty golden; fruits almond-shaped, up to 4,5 cm long, and densely velvety ..... **Proteaceae** (p. 156)

11. a. New leaves and petioles purplish; bark fibrous peeling off in stringy, longitudinal strips; flowers whitish in large showy heads; occurring in forest ..... **Buddlejaceae** (p. 933)
b. Petiole reddish; leaves dark green with midrib yellowish, conspicuous; plants confined to the arid mountains in the Clanwilliam district ..... **Euphorbiaceae** (p. 460)

12. a. Bark fibrous peeling off in stringy, longitudinal strips; leaf margin entire or coarsely toothed, particularly on coppice shoots; flowers whitish in large showy heads .... **Buddlejaceae** (p. 933)
b. Branches 4-angled; leaves usually hairy, margin entire or toothed particularly when young; montane, usually near streams or at forest margins; fruit a woody ovoid capsule surrounded by the persistent calyx ..... **Scrophulariaceae** (p. 1001)

13. a. Sap white to watery **14**
b. Sap yellow or watery; fruit fleshy in groups of 5–15 on short knobbly spur-branchlets clustered along the older stems ..... **Clusiaceae** (p. 733)

14. a. Leaves in distinct whorls of 3–6, frequently 4; fruit twin berries or paired dry follicles, sometimes only 1 by abortion ..... **Apocynaceae** (p. 941)
b. Leaves in whorls of 3, spread out along the stems, sometimes in such a way that they look spirally arranged, with numerous lateral veins close together, may or may not divide just before reaching the margin; fruit kidney-shaped usually smaller than 1,5 cm long or in diameter ... . **Anacardiaceae** (p. 538)

15. a. Leaves with a green-leaf smell when crushed **17**
b. Leaves aromatic or pungent when crushed **16**

16. a. Leaves with an unpleasant smell when crushed; margin coarsely toothed or scalloped; fruit a small drupe ..... **Lamiaceae** (p. 976)
b. Leaves pleasantly aromatic when crushed; margin entire; undersurface with dense silvery scales and conspicuous dark reddish brown to red scale-dots; fruit a capsule .... **Euphorbiaceae** (p. 460)

17. a. Leaves in whorls of 3, spread out along the stems, sometimes in such a way that they look spirally arranged, with numerous lateral veins close together, may or may not divide just before reaching the margin; fruit kidney-shaped usually smaller than 1,5 cm long or in diameter ... . **Anacardiaceae** (p. 538)
b. Leaves discolorous, often with midrib and lateral veins indented above to give a wrinkled or puckered appearance; flowers in conspicuous terminal sprays, sweetly scented; fruit a small capsule protruding for about half its length beyond the persistent calyx .... **Buddlejaceae** (p. 933)

18. a. Leaves in whorls of 3 or 4 at the ends of the branches, opposite to sub-opposite further back; leathery, margin slightly to markedly wavy; sometimes look dirty; young parts with a granular rust-coloured exudate; fruit a round, usually 1-seeded berry ..... **Ebenaceae** (p. 885)
b. Leaves in whorls of 3 on short shoots, also alternate or spirally arranged on longer shoots, sometimes hard and brittle, snapping when bent, or leathery, margin jaggedly toothed or entire; fruit an ellipsoid drupe ..... **Celastraceae** (p. 587)

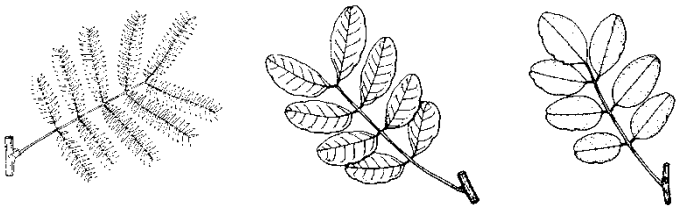
19. a. Leaf margin entire; fruit crowned with the remains of the persistent calyx, or calyx scar ..... **Rubiaceae** (p. 1021)
b. Leaf usually serrated at least towards the apex, entire towards the base; fruit a capsule, sharply tipped with the remains of the old style and with the persistent sepals around the base..... **Rhizophoraceae** (p. 783)

20. a. Very young leaves and shoots distinctly pink, reddish or bronze, often becoming yellowish green before assuming their mature colour; fruit an ovoid to almost round, fleshy berry tipped with the remains of the persistent calyx ..... **Myrtaceae** (p. 824)
b. Young branchlets 4-angled, sometimes pinkish, petioles often pink to purplish; leaves with a faint smell of almonds when crushed; fruit a drupe, dry or thinly fleshy, with a circular scar at the apex ..... **Oliniaceae** (p. 771)

21. a. Leaves with an unpleasant smell when crushed; margin entire or not entire; fruit a small drupe ..... **Lamiaceae** (p. 976)
b. Leaves pleasantly aromatic when crushed, with golden gland dots and fine soft hairs, margin entire or finely scalloped particularly when young; branches 4-angled; fruit a woody ovoid capsule surrounded by the persistent calyx ..... **Scrophulariaceae** (p. 1001)

B Leaves compound

(1) Leaves compound, pinnate



1. a. Leaves once-pinnate **2**
b. Leaves bipinnate **4**

2. a. Leaves (not leaflets) alternate or spirally arranged **3**
b. Leaves obviously opposite or whorled **7**

3. a. Leaves imparipinnate (end in a single leaflet) **14**
b. Leaves paripinnate (end in a pair of leaflets) **12**

4. a. Leaves alternate or spirally arranged **5**
b. Leaves opposite ..... **Bignoniaceae** (p. 1006)

5. a. Leaves with or without glands, position variable; fruit fleshy or a 2-sided pod **6**
b. Leaves with glands at the base of the petiole and the pinnae; fruit a pod-like capsule, 3-sided, splitting into 3 valves ..... **Moringaceae** (p. 237)

6. a. Leaves without 1 leaflet conspicuously right at the junction of the pinna and the rachis ..... **Fabaceae** (p. 253)
b. Leaves frequently with 1 leaflet conspicuously placed right at the junction of the pinna and the rachis; occurring only in central Mozambique and northwards ... **Sapindaceae** (p. 638)

7. a. Leaves imparipinnate **8**
b. Leaves paripinnate, rachis slightly winged, leaflets obliquely rectangular, base markedly asymmetric; translucent gland dots seen when the leaflets are held against a strong light, unpleasantly aromatic when crushed ..... **Ptaeroxylaceae** (p. 658)

8. a. Leaves with 2 or more pairs of leaflets **9**
b. Leaves with 1 or 2 pairs of leaflets, petiole and rachis winged ..... **Oleaceae** (p. 912)

9. a. Leaves with a green-leaf smell when crushed; margin without translucent gland dots **10**
b. Leaves aromatic when crushed, softly velvety on both surfaces, margin entire but with closely spaced translucent gland dots all the way around making it look minutely scalloped ..... **Rutaceae** (p. 408)

10. a. Stipules absent; sometimes with pseudo-stipules **11**
b. Butterspoon-like growing tip distinctive; growing tips enclosed by 2 large, paddle-like stipules; young stems, petioles and veins pinkish; fruit a 2-horned, leathery brown dehiscent capsule ..... **Cunoniaceae** (p. 242)

11. a. Leaflets opposite, articulated; margin often not entire; fruit a capsule, often pod-like ..... **Bignoniaceae** (p. 1006)
b. Leaflets opposite to alternate, margin entire; fruit 1–5 follicles, splitting along one side only so that the fruit wall curls back and the seed protrudes through the opening; seed with a red or orange aril ..... **Connaraceae** (p. 252)

12. a. Leaflet margin entire; terminal leaflets distinctly a pair **13**
b. Leaves with 1 of the terminal pair of leaflets often twisting around so the leaf appears imparipinnate; leaflet margin entire or not entire; watery sap often present ..... **Sapindaceae** (p. 638)

13. a. Leaves with large leaflets, each usually longer than 5 cm and with distinct stalks; fruit a woody capsule ..... **Meliaceae** (p. 443)
b. Most leaflets shorter than 7,5 cm; fruit a pod ..... **Caesalpinioideae** (p. 312)

14. a. The stalks of the 3 end leaflets grow from the same point (the stalk of the end leaflet sometimes longer than the others, but still starts at the same point) (most obvious below) **15**
b. The stalk of the end leaflet starts further along the rachis (central stalk) than the lateral ones and is often swollen forming a pulvinus ..... **Papilionoideae** (p. 346)

15. a. Leaves with a green-leaf smell when crushed **20**
b. Leaves aromatic when crushed **16**

16. a. Leaves pinnate with only 1 or 2 leaflets arising from the same point on the rachis **17**

b. Leaves pinnate with up to 9 leaflets and 2, 3 or 4 often arising from the same point on the rachis, smell of parsnips when crushed; bark reddish-brown, papery, sometimes peeling in rings ..... **Apiaceae** (p. 852)

17. a. Leaves without translucent gland dots **18**
b. Leaves with conspicuous translucent gland dots seen when held against the light; sometimes armed with spines or prickles; rachis occasionally winged; fruit 2-lobed, often with 1 lobe not developing, dotted with glands, yellowish green to brown or orange ..... **Rutaceae** (p. 408)

18. a. Leaflet margin conspicuously toothed **19**
b. Leaflet margin entire or toothed; often with a distinctive bark; watery or milky sap usually present; deciduous, often losing their leaves early and standing leafless **35**

19. a. Leaflet margin jaggedly toothed, each tooth hair-tipped; stipules absent; inflorescence resembles that of a carrot; fruit flattened, heart-shaped, formed from 2 mericarps that split away from each other, in large untidy clusters ..... **Apiaceae** (p. 852)
b. Leaflet margin deeply and jaggedly toothed; stipules brown, next to and longer than the petiole, sheathing the stem, persistent for years after the leaves have been shed; fruit a group of small nuts enclosed in the base of the old flowers ..... **Rosaceae** (p. 245)

20. a. Leaves with rachis and petiole not winged **26**
b. Leaves with rachis and petiole winged **21**

21. a. Leaves with more than 2 pairs of leaflets **22**
b. Leaves with 1 or 2 pairs of leaflets plus the terminal one; leaflets bluish green, with pale, conspicuous veining ..... **Meliaceae** (p. 443)

22. a. Plants without a milky or watery latex **24**
b. Plants with milky or watery latex present **23**

23. a. Leaves with the blades of the leaflets running into a winged rachis and petiole, to give the appearance of a deeply divided single leaf; fruit thinly fleshy, when mature splitting into 2 sections which fall away to reveal a single black stone, most frequently with a pseudo-aril, with or without lobes, often brightly coloured, clasping the base ..... **Burseraceae** (p. 425)
b. Leaves not resembling a deeply lobed simple leaf; fruit small embedded in the persistent, brightly coloured sepals which enlarge slightly and deepen in colour, skin contains a black sticky substance, somewhat resembling tar ..... **Anacardiaceae** (p. 538)

24. a. Leaflets with base usually asymmetric **25**
b. Leaflets with base tapering, symmetric; fruit a spherical capsule, smooth, about 2,5 cm in diameter ..... **Melianthaceae** (p. 659)

25. a. Leaflet margin usually entire ..... **Sapindaceae** (p. 638)
b. Leaflet margin markedly toothed or scalloped; fruit fleshy, markedly 5- to 6-lobed with vertical grooves ..... **Simaroubaceae** (p. 422)

26. a. Leaflet margin usually entire **27**
b. Leaflet margin markedly toothed or scalloped **33**

27. a. Leaves not spectacularly large, usually shorter than 50 cm, without creamy rusty hairs on the undersurface, trees not particularly parasol-shaped **28**
b. Leaves very large, up to 80 cm long, 9–12 pairs of leaflets plus the terminal one, which is sometimes missing; leaflets large 9–16 × 4,5–8 cm, undersurface densely velvety with creamy rusty hairs; base lobed and clasping the rachis; trees characteristically with a clear straight bole and branches developing high up to form a narrow crown ..... **Araliaceae** (p. 844)

28. a. Leaves often slightly aromatic when crushed and with a watery sap; stipules absent; fruit a fleshy drupe **35**
b. Leaves with a green-leaf smell when crushed; fruit a pod or capsule or drupe **29**

29. a. Stipules absent **32**
b. Stipules usually present **30**

30. a. Stipules present but seldom conspicuous; fruit a pod **31**
b. Stipules present between the petiole and the stem; flowers and fruit usually in firm, upstanding racemes with conspicuous bracts; fruit a woody or leathery capsule ..... **Melianthaceae** (p. 659)

31. a. Plants rarely armed with spines; flowers with petals conspicuous; fruit a pod ..... **Papilionoideae** (p. 346)
b. Leaflets with midrib grooved above, base markedly asymmetric; flowers with petals minute and inconspicuous or absent; pods almost round to ellipsoid, velvety; with a dry pith surrounding the seeds ..... **Caesalpinioideae** (p. 312)

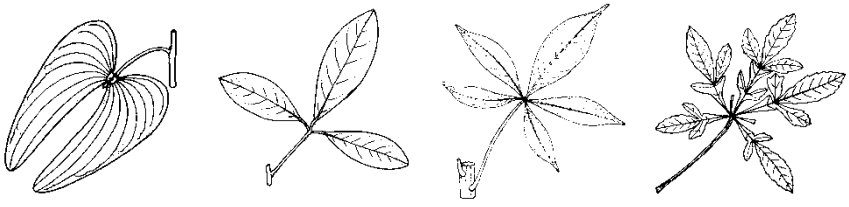
32. a. Leaves dark green with numerous lateral veins that almost reach the margin, or light shiny green to bluish green, sometimes with pink patches or pink on the petiole and rachis; fruit a capsule or a drupe ..... **Meliaceae** (p. 443)
b. Leaves bright green above, paler below, or dark shiny green above, pale bluish green below; fruit 1–5 follicles, reddish brown, splitting along one side only so that the fruit wall curls back and the seed protrudes through the opening; seed with a red or orange aril ..... **Connaraceae** (p. 252)

33. a. Stipules absent **34**
b. Stipules present between the petiole and the stem; flowers usually bisexual; flowers and fruit usually in firm, upstanding racemes, with conspicuous bracts; seeds with a yellowish aril ..... **Melianthaceae** (p. 659)

34. a. Leaves often slightly aromatic when crushed and with a watery sap; stipules absent; fruit a fleshy drupe **35**
b. Leaves clustered at the ends of the branchlets, with a green-leaf smell when crushed, sticky when young, become splendidly coloured gold and red in autumn, leaflets narrowly ovate, base asymmetric, fruit a capsule ..... **Kirkiaceae** (p. 423)

35. a. Bark often peeling or flaking; secreting resin, sometimes armed with spines; leaflet margin entire or not entire; floral parts in 4s, style 1; fruit thinly fleshy, when mature splitting into 2 sections which fall away to reveal a single black stone, most frequently with a pseudo-aril, with or without lobes, often brightly coloured, clasping the base ..... **Burseraceae** (p. 425)
b. Bark sometimes flaking in large pieces, often resinous; leaflets with margin entire except occasionally on young and coppice growth, with a turpentine-like smell when crushed; plants unarmed, floral parts in 4s to 7s, styles 3–5, free; stone in the fruit without a pseudo-aril ..... **Anacardiaceae** (p. 538)

(2) Leaves compound, not pinnate



1. a. Leaves (not leaflets) alternate or spirally arranged **2**
b. Leaves obviously opposite or whorled **5**

2. a. Leaves with 2 or 3 leaflets (bifoliolate or trifoliolate) **4**
b. Leaves with 4 or more leaflets (digitate or palmate) **3**

3. a. Plants without a milky or watery sap **21**
b. Plants exude a milky or watery sap; leaflets dark green above, pale grey below **20**

4. a. Leaves with 2 leaflets ***6***
b. Leaves with 3 leaflets **10**

5. a. Leaves aromatic when crushed (when more than 3 leaflets, leaves digitate) **9**
b. Leaves not aromatic (with a green-leaf smell) when crushed **8**

6. **a.** Plants unarmed ***7***
b. Plants armed with spines ..... **Balanitaceae** (p. 406)

7. **a.** Leaflets 3–12 cm long, petiole slender; fruit a pod ..... **Caesalpinioideae** (p. 312)
b. Leaflets 10–20 cm long, on a short spur-like petiole 5–12 mm long; fruit fleshy ..... **Sapindaceae** (p. 638)

8. a. Leaflet margin entire; rachis and petiole winged (if more than 3 leaflets, leaves pinnate) ..... **Oleaceae** (p. 912)
b. Leaflet margin roughly toothed, rarely entire; fruit a small, russet to dark brown capsule, in branched clusters among the leaves ..... **Cunoniaceae** (p. 242)

9. **a.** Leaves without translucent gland dots; fruit a fleshy drupe, or a dry nut with an enlarged persistent calyx at the base ..... **Lamiaceae** (p. 976)
b. Leaves with conspicuous translucent gland dots; fruit 2-lobed, often with 1 lobe not developing, dotted with glands, yellowish green to brown or orange ..... **Rutaceae** (p. 408)

10. a. Not a constituent of mangrove swamps; without pneumatophores **11**
b. Occurring in tidal mud, near the upper limits of the swamp; surface roots forming more or less horizontal, ribbon-like pneumatophores, with the upper edges protruding above the mud and suggesting a mass of snakes (if more than 3 leaflets, leaves pinnate) ..... **Meliaceae** (p. 443)

11. a. The stalks of the 3 leaflets grow from the same point (the stalk of the middle leaflet sometimes longer than the others, but still starting at the same point) (most obvious below) **12**
b. The stalk of the end leaflet starts further along the rachis (central stalk) than the lateral ones and can be swollen forming a pulvinus ..... **Papilionoideae** (p. 346)

12. a. Petiole usually shorter than terminal leaflet (care should be taken with the next species) **13**
b. Petiole very long, often longer than the terminal leaflet; leaves turning red before they fall and the occasional red leaf can often be seen; fruits and flowers forming large heads near the ends of the branchlets, fruits compressed, with a conspicuous circular wing (*Smodingium argutum*) **N.B.** This is a poisonous plant to susceptible people; the sap can cause a livid rash that swells and blisters ..... **Sapindaceae** (p. 638)

13. a. Leaves aromatic when crushed **14**
b. Leaves with a green-leaf smell when crushed **18**

14. a. Leaves usually with 3 leaflets **15**
b. At least some leaves with more than 3 leaflets, pinnate with 2, 3 or 4 all arising from the same point along the rachis, smell of parsnips when crushed; bark reddish brown, papery, sometimes peeling in rings ..... **Apiaceae** (p. 852)

15. a. Leaflets not lobed **16**
b. Leaflets often lobed, the apex of the lobes with a pointed tip, a distinct sub-marginal vein and coarsely reticulate net-veining; fruit with mericarps equal, unwinged ..... **Apiaceae** (p. 852)

16. a. Leaves without translucent gland dots **17**
b. Leaves with conspicuous translucent gland dots seen when held against a strong light; fruit 2-lobed, often with 1 lobe not developing, dotted with glands, yellowish green to brown or orange ..... **Rutaceae** (p. 408)

17. a. Stems with lenticels frequently prominent; armed or unarmed; freshly picked leaves often exuding a drop of watery or cloudy liquid, resin canals visible between the base of the leaf and the petiole, even with the naked eye; crushed leaves with a strong and distinctive smell, reminiscent of green apples; fruit a small, fleshy drupe, often flattened, in many-fruited, branched heads ..... **Anacardiaceae** (p. 538)

b. Stems often with a distinctive bark; resinous sap usually present; deciduous, often losing their leaves and standing leafless for months, sometimes armed; fruit thinly fleshy, when mature splitting into 2 sections which fall away to reveal a single black stone, most frequently with a pseudo-aril, with or without lobes, often brightly coloured, clasping the base ..... **Burseraceae** (p. 425)

18. a. Base of the lateral leaflets symmetric or if asymmetric the midrib more or less goes through the middle **19**

b. Lateral leaflets have a very asymmetric base and the midrib goes up one side with 1 or 2 lateral veins branching out into the lobe; stems with swellings on the joints and sometimes with leaf opposed tendrils like a grape vine ..... **Vitaceae** (p. 676)

19. a. Leaflets with lateral veins very regular, curve out to the margins which are often scalloped around the top third; often with pockets of white hairs in the axils of the lateral veins and the midrib below; fruits round, crimson, sometimes turning purplish black, tightly clustered along the axes of a spike-like raceme ..... **Sapindaceae** (p. 638)

b. Leaflets with lateral veins, when visible not quite reaching the margin, cream-coloured midrib prominent below, apex sometimes with a hair-like tip; fruit pendulous, on a jointed stalk up to 15 cm long ..... **Capparaceae** (p. 220)

20. a. Leaves with stellate hairs on both surfaces, leaflet margin entire, edged with gland dots; 2–4 bright green glands at the junction with the petiole; occurring on Kalahari sand ..... **Euphorbiaceae** (p. 460)

b. Leaves without hairs; leaflet margin finely and regularly serrated; without glands at the junction with the petiole; occurring in evergreen forest ..... **Cecropiaceae** (p. 153)

21. a. Plants without tendrils **22**

b. Plants with tendrils opposite the leaves ..... **Vitaceae** (p. 676)

22. a. Leaves mono-digitate, with simple leaflets **23**

b. Leaflets bi-digitate or multi-digitate with leaflets compound being dissected into the midrib, dividing them again; trees grow straight up and the leaves form a mop on the top ..... **Araliaceae** (p. 844)

23. a. Leaflet margin entire **24**

b. Leaflet margin not entire; flowers in spikes which become elongated as the fruits develop ..... **Araliaceae** (p. 844)

24. a. Leaflets about twice as long as wide; leaves sometimes with only 3 leaflets **25**

b. Leaflets 3–4 or more times as long as wide; flowers without petals; fruit boat-shaped carpels in clusters of 2–5, splitting down 1 side only ..... **Sterculiaceae** (p. 707)

25. a. Leaves 3- to 7-foliolate, pungent when crushed; flowers large and showy; petals present and conspicuous; fruit a large indehiscent capsule ..... **Bombacaceae** (p. 705)

b. Leaflets with lateral veins, when visible not quite reaching the margin, cream-coloured midrib prominent below, apex sometimes with a hair-like tip; fruit pendulous, on a jointed stalk up to 15 cm long ..... **Capparaceae** (p. 220)

PTERIDOPHYTES (The ferns and related groups)

CYATHEACEAE (The tree fern family)

CYATHEA Sm.

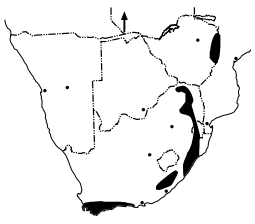
Stems: usually straight, covered with brown scales and old persistent leaf bases. **Leaves (fronds):** large, arching, compound, tripinnate, produced in a crown at apex of the stem; spores produced in sori, positioned along the veins on the undersurface of the leaflets.

Key to the tree species of **Cyathea** (all very similar in general appearance):

1. **a.** Stem and leaves not spiny **2**
   b. Stem, stipe and rachis (leaf stems) sharply spiny ..... **C. manniana**
2. **a.** Aphlebia absent; leaflet margin entire **3**
   b. Leaflets at the extreme base of leaf modified into a tangled mass of fine, hair-like structures, resembling fibrous roots, called 'aphlebia'; leaflet margin finely toothed ..... **C. capensis**
3. **a.** Undersurface of leaflets hairless, or with sparse, loose, rusty, hair-like scales which readily fall off (10× lens) ..... **C. dregei**
   b. Very similar to *C. dregei*, but the undersurface of the leaflets always has pale, stiff, twisted hairs along the veins (10× lens) ..... **C. thomsonii**

Cyathea capensis (L.f.) Sm.

[*Alsophila capensis* (L.f.) J.Sm.; *Hemitelia capensis* (L.f.) Kaulf.]
S.A. no: 2 **Forest Tree Fern. Bosboomvaring**
Zimb. no: 1 **Forest Tree Fern**

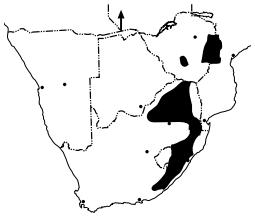


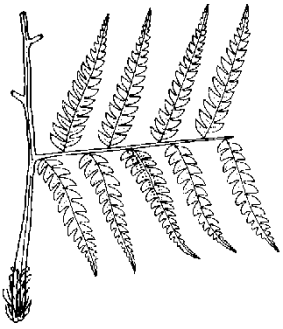
Height: up to 5 m; occurring in moist evergreen forests, usually above 1370 m, although also at lower altitudes in the wet forests around Knysna. **Leaves:** large, up to 3 m long; stalks smooth; leaflets with a finely toothed margin; lowermost leaflets modified to form a conspicuous tangled mass of green, later brown, hair-like structures called 'aphlebia'; appearing as though a different fern is growing at the top of the stem.

These trees are said to transplant badly and will not tolerate drying winds, sunshine, frost or any degree of drought.

Cyathea dregei Kunze

[*Alsophila dregei* (Kunze) R.M.Tryon]
S.A. no: 1 **Grassland Tree Fern. Gewone Boomvaring**
Zimb. no: 2 **Grassland Tree Fern**



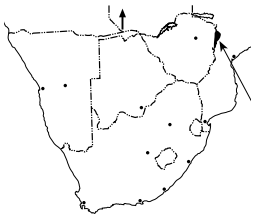


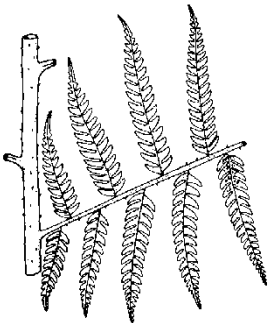
Height: usually 3–5 m, but may reach 7 m; occurring in forest margins and wooded kloofs but also in the open along streams on grassy mountainsides. **Leaves:** 2–3 m long; stalks smooth; leaflet margin entire; aphlebia absent.

This is the most common and widespread of the tree ferns.

Cyathea manniana Hook.

[*Alsophila manniana* (Hook.) R.M.Tryon; *C. deckenii* Kuhn]
Zimb. no: 3 **Spiny Tree Fern**

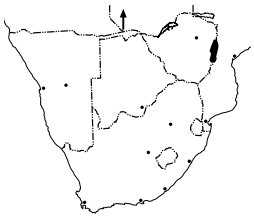


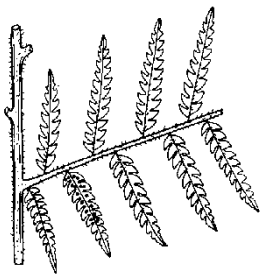


Height: 6 m; slender, tending to lean over and even becoming prostrate, when upright shoots are produced from the recumbent stem; lateral prop stems sometimes formed; occurring in wet, shaded places in forests. **Stem:** dark and spiny. **Leaves:** 2–3 m long; leaf bases and stalks armed with sharp prickles, a feature that sets this species apart from the others.

Cyathea thomsonii Baker

[*Alsophila thomsonii* (Baker) R.M.Tryon*; C. zambesiaca* Baker]
Zimb. no: 4 **Thomsons Tree Fern**





Height: up to 3 m; slender; occurring in forests and along shaded stream banks.

This species closely resembles *C. dregei* but has pale and twisted hairs on the undersurface of the leaflets.

SPERMATOPHYTES (The seed-bearing plants)

GYMNOSPERMS (The cone-bearing plants)

Cycadophyta

This is an ancient group of plants which flourished during the Mesozoic era, 250 to 65 million years ago: in the Triassic period (250 to 203 million years ago); the Jurassic period (203 to 135 million years ago); and the Cretaceous period (135 to 65 million years ago). The plants were especially diverse and abundant during the Jurassic period. Those which exist today represent only a remnant of this once-dominant group, for the cycads are now a dying race. However, the fact that they have survived some 65 million years indicates how immensely resilient and successful they have been.

At present three families are recognised within the **Cycadophyta:**

1. **Stangeriaceae,** which has only one genus and a single species: *Stangeria eriopus* (Kunz) Baill. is endemic to South Africa, and occurs from the Eastern Cape to Northern KwaZulu-Natal. This low-growing, fern-like plant with firm, leathery leaves has never been known to reach tree proportions.
2. **Cycadaceae**, which has only one genus, *Cycas*, and species ranging from Australia to Japan, China and India; one species occurs on the east coast of tropical Africa in Madagascar, and on islands in the Indian Ocean.
3. **Zamiaceae**, which includes some eight genera ranging from Mexico to Australia and southern Africa; in southern Africa only one genus, *Encephalartos*, occurs.

Key to the tree genera of **Cycadophyta** (this key cuts across two families):

1. a. Leaflets with a single midrib; female cone a terminal head of loose, densely woolly scale leaves ..... **Cycas**

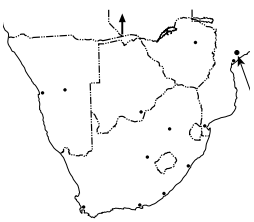
b. Leaflets with many parallel veins; female cones compact, scales fitting tightly together .... **Encephalartos**

CYCADACEAE (The cycas family)

CYCAS L.

Cycas thouarsii Gaudich.

Moz. **African Cycas**



Stems up to 10 m; usually unbranched; occurring in hot, humid areas fringing forest or in open woodland, not further south than the Zambezi delta. **Leaves:** 1–3 m long, upright at first, pendant later; leaflets long and slender, up to 30 × 1 cm, with a conspicuous yellowish midrib and no secondary veins; apex spine-tipped; margin entire; lowermost leaflets reduced to short prickles. **Cones:** male and female on separate trees; male cones yellowish orange, up to 60 × 20 cm, with close, wedge-shaped scales; female cones consisting of loose, spirally arranged scales covered with dense, creamy grey, woolly hairs, the outer margin of the scales irregularly toothed and scalloped, each scale bearing 2–5 pairs of ovules. **Seeds:** almost spherical, 6 × 5 cm, brick red; they develop only if fertilised, in contrast to those of *Encephalartos*.

This plant has a long tap root which will not regenerate if damaged. Unless given the hot, humid conditions of its natural environment, the plant will struggle to survive in cultivation.

ZAMIACEAE (The cycad family)

ENCEPHALARTOS Lehm.

Male and female trees separate, not distinguishable without cones. **Stem:** usually unbranched, occasionally suckering from the base and forming clumps, usually aerial and covered with alternating series of woolly bracts and dry, hard, persistent leaf bases, but in some species the stem is subterranean. **Leaves:** large, up to 3,5 m long, arising spirally at the stem apex and forming a crown, each leaf lasting 2 years or more; pinnate; leaflets spine-tipped, hard, thick and leathery, margin entire, toothed or lobed along margin of 1 or both surfaces; sometimes the lowermost leaflets reduced to a series of spines; veins parallel, numerous, with no defined midrib. **Cones:** 1–5, sometimes more, with short stalks, on or around the stem apex; male cones usually smaller than female

cones, sub-cylindrical, the scales densely packed in many spiral rows, with the tip of each scale forming a thickened, down-curving beak; pollen produced in densely packed sacs on the under-surface of the scale leaves; female cones usually larger and broader than male cones, scales densely packed, each bearing only 2 naked ovules on the upper surface, the tip of each scale forming a shield-like head. **Seeds:** large, red, yellow or brown, fleshy; development slow, but will develop fully whether fertile or not (cf. seeds of *Cycas*).

The poisonous properties and the food value of cycads

Cycad seeds are large with a fleshy outer layer and an inner kernel. The fleshy layer is often edible, but the kernel may be poisonous; the seeds of *E. longifolius* have been known to cause the death of cattle, yet many of the seeds are eaten by baboons, monkeys, rodents and birds. It is difficult to distinguish the poisonous seeds from the non-poisonous ones, so it would be as well to avoid eating the seeds of all species.

The pith within the stems of almost all cycads yields a high-quality starch very similar to that produced from the rhizomes of *Maranta arundinacea* L., the arrowroot. This is a pure, nutritious starch recommended for infants and invalids, and also used in high-quality confectionery. Carl Thunberg was the first to record its use by the African people. Between 1772 and 1779 he collected the first specimens of *E. longifolius*, which he called the bread tree, and he described how the trunks were split open to remove the pith, which was then wrapped in an animal skin and buried underground to partly ferment. The resulting fibrous mass was then ground to a flour, made into a dough with water, shaped into small loaves and baked under the glowing coals of a fire. Probably all the species could be – and were – used in a similar fashion.

Most species produce so-called coralloid roots from the primary and secondary roots. These are odd structures resembling clusters of fungi and occurring just at ground level. They have been found to contain cyanobacteria, and these assist the cycad by fixing atmospheric nitrogen.

Cycads are fairly resilient to fire and drought, but their problem is man. All cycad species are protected in South Africa and Zimbabwe. Nevertheless, the number of cycads in the wild has become drastically reduced, due to the desire of gardeners to transplant them into their gardens. To possess a wild cycad appears to be a status symbol, and one that must be acquired at all costs – all costs to the plant that is, but little to the pocket. The cycads are dug out from where they grow naturally, transported to a different environment and replanted. If they have not 'taken' and produced new leaves fairly quickly, they are uprooted and dumped on the rubbish heap by gardeners ignorant of their growth patterns.

As a group, the cycads are slowly dying out. The few species that still exist today represent the many that were most successful in the past, and as the last survivors they should be static and well-founded. Keith Coates Palgrave believed that too many species have been recognised, in southern Africa at least, resulting in a situation in which supposedly different, but very closely related, species are found on adjacent hills or in neighbouring river valleys. The species are said to occur nowhere else, and often there is no apparent natural barrier which could account for the separate development of these small populations. Obviously this is not a widely held belief, and since the first edition of this publication a number of new species have been described and have been included in the key. Habitat information has been kept to a minimum in the interests of the cycads' conservation.

Cycads of South Africa by Cynthia Giddy, Excelsa no. 18, published by The Aloe Cactus and Succulent Society of Zimbabwe, R.A. Dyer & I. Verdoorn in: Flora of South Africa (1966), Bothalia no. 8 and Kirkia no. 7 and various recent papers in the South African Journal of Botany have all been consulted during the updating of this genus.

Key to the tree species of **Encephalartos**:

1. **a.** Occurring in South Africa .. ..
b. Occurring in Zimbabwe and adjacent areas in Mozambique ..... see under **E. manikensis**

2. **a.** Leaflets very narrow, less than 1 cm wide **3**
b. Leaflets 1 cm or wider **7**

3. **a.** Leaflets 4–10 mm wide **4**
b. Leaflets 2–4 mm wide and conspicuously tightly rolled under, appearing needle-like; occurring from Flagstaff east and north, to the slopes of the Drakensberg ... . **E. ghellinckii**

4. a. Lower leaflets horizontal or ascending, not pointing downwards; bottom leaflets not reduced to prickles; cones yellow **5**
b. Leaflets fresh silvery green, the middle ones at 90° to the rachis, the lower ones pointing downwards and the bottom ones reduced to 2–6 prickles; cones silvery green; found in the Lydenburg district in Mpumalanga ..... **E. inopinus**

5. a. Stem and crown markedly woolly; rachis green **6**
b. Stem with regularly patterned leaf bases and the crown not particularly woolly; leaflets with a greyish bloom when young; rachis yellow; a high-rainfall species occurring in Mpumalanga and adjacent Swaziland ..... **E. laevifolius**

6. a. Leaves with rachis curved and slightly twisted; leaflets with a greyish bloom when young, with 10–14 veins visible on the undersurface; occurring in the Middelburg, Witbank and Bronkhorstspruit districts ..... **E. lanatus**
b. Leaves held at an angle of 45° to the brown woolly crown; young leaflets with 7–9 veins visible on the undersurface; occurring from Uitenhage to Kokstad ..... **E. friderici-guilielmi**

7. a. Leaflets 1–2 cm wide **8**
b. Leaflets 2 cm or wider **19**

8. a. Leaflets blue-green or silvery green **13**
b. Leaflets dark glossy green, slightly sickle-shaped; occurring in KwaZulu-Natal **9**

9. a. Leaves longer than 1 m; leaflets longer than 10 cm, margin of both surfaces with teeth; the lowermost leaflets reduced to prickles **10**
b. Leaves 80–90 cm long; leaflets 6–8 cm long, margin entire; bottom leaflets smaller but not reduced to prickles; stems up to 2,5 m, often suckering from the base, forming clumps of up to 6 stems that often lean over; male cones 35 × 6–7 cm, up to 6 per stem, with short, fine, grey hairs but not woolly; female cones unknown; occurs in grassland on the Drakensberg in the Limpopo Province ..... **E. brevifoliolatus**

10. a. Crown covered with dense brown wool; cones yellow **12**
b. Crown only slightly woolly; median leaflets heavily toothed and overlapping to form a pattern; cones pale apricot-yellow **11**

11. a. Stem with a patchwork effect made up of small and large leaf bases; lowermost leaflets reduced to form numerous prickles; petiole densely prickled right to the base; male cones usually solitary, without a stalk; occurring in the Piet Retief area, but may now be extinct in the wild ..... **E. lebomboensis**
b. Stem up to 4 m tall, covered with the remains of the leaf bases; leaves 1–1,5 m long, rigid and straight to slightly arched; leaflets 12–18 cm long, glossy dark green, margin of both surfaces with teeth; the lowermost leaflets reduced to prickles; male cones 3 or 4 together on stalks up to 10 cm long; female cones 2 or 3 per stem; occurring in the Pongola River valley and on the Lebombo Mountains in KwaZulu-Natal and Swaziland ..... **E. senticosus**

12. a. Stem up to 3 m tall, often suckering from the base; leaves 1,1–1,5 m in length, rigid and straight to slightly arched; leaflets 14–17 cm long, glossy dark green, forming a V-shape, margin entire or toothed; lowermost leaflets reduced to prickles; male cones 2–4, on stalks up to 7 cm long, apparently glabrous, pale yellow; female cones without a stalk, yellow but covered with a mat of brown hairs; occuring in the vicinity of Msinga near Tugela Ferry in KwaZulu-Natal ..... **E. msinganus**
b. Stem 1,5 m tall, occasionally up to 3 m; crown densely woolly; leaves up to 1,45 m long; leaflets 12,5–15 cm, dark glossy green, overlapping, margin with 1–3 teeth on both surfaces; lowermost leaflets reduced to several prickles; cones 2–4 per stem, buried in the crown of the stem; male cones lemon-yellow, densely covered with brown hairs, terminal facet markedly protruding, wide and rhombic, lateral facets with glandular hairs and radiating warty ridges; female cones green, covered with dense brown hairs; restricted to one area in the Vryheid district ..... **E. aemulans**

13. a. Base of the petiole without a prominent collar **14**
b. Base of the petiole with a prominent collar; the end of the rachis bending over **18**

14. a. Leaves twisted and bent backwards **17**
b. Leaves stiff or curling upwards **15**

15. a. Mature leaflets hairless **16**
b. Leaflets light green, margin usually entire; with copious amounts of brown wool on the stem, crown, cones and leaflets even when mature; male and female cones very much the same shape and size ..... **E. heenanii**
16. a. Leaves held horizontally to the crown with a tip that curls upwards; the lowermost leaflets not reduced to prickles; occurs in the Waterberg in the Limpopo Province .. **E. eugene-maraisii**
b. Leaves at 45° to the trunk, rachis stiff and straight, not curling over, up to 1,5 m long, blue-green; leaflets up to 19 cm long, separate, not overlapping; margin entire, or usually with 1 or 2 small teeth on both surfaces; the lowermost leaflets reduced to prickles; stems up to 6 m long, often suckering from the base and forming clumps; male cones 5–8 together, bright green with reddish brown patches, on distinct stalks up to 17 cm long; female cones 4 or 5 together, on stalks hidden by the leaf-like structures at the top of the trunk; occurring among rocks, mostly on steep slopes near Middelburg ..... **E. middelburgensis**
17. a. Leaves up to 1,25 m long, twisted towards the apex; leaflets bluish green, turning slightly yellow, 19–21 cm long, margin entire, or with 1 or 2 small teeth on both surfaces; the lowermost leaflets reduced to prickles; stems up to 4 m, often suckering from the base, forming clumps; cones green turning yellow when mature, borne on distinct stalks over 6 cm long; male cones 4–7 together; female cones 1–5 together; occurring on a granite koppie in Mpumalanga ..... **E. dyerianus**
b. Leaves rather short, 60–80 cm long, twisted and bent backwards; leaflets bluish green, with a silvery bloom when young, 12–16 cm long, margin entire or with 1–2 small teeth on the lower surface; lowermost leaflets reduced to 1 or 2 prickles; stems about 0,8–1,2 m; male cones 1–3 together; female cones solitary, blue-green turning yellowish when mature; occurring among dolomite rocks on the Drakensberg in the Limpopo Province ... **E. dolomiticus**
18. a. Middle leaflets with space between them, not overlapping; base of petiole exposed and collar prominent; cones solitary; occuring in karroid scrub and bush west of the Kei River ... . **E. lehmannii**
b. Middle leaflets close together and overlapping; base of the petiole partly hidden by the bracts at the top of the trunk; usually with more than 1 cone; occuring in the catchment area of the Kei River ..... **E. princeps**
19. a. Leaflet margin may be toothed but without spine-tipped lobes **21**
b. Leaflet margin deeply lobed with the tips ending in a spine **20**
20. a. Leaves dull green with a bloom, 1–1,5 m long, the top half curling over, bottom leaflet occasionally reduced to a prickle; leaflets up to 12–16 × 2,5–4 cm, veins not prominent below; stems up to 1,5 m; upper margin entire or with 1 tooth, lower margin with 3 spine-tipped lobes; cones single, green with a slight bloom; associated with coastal sand dune scrub and bush in the Alexandria district in the Eastern Cape ..... **E. arenarius**
b. Leaflets glossy dark green, with 2 or 3 teeth on lower margin and 1 large tooth near the apex, giving a 'forked tongue' appearance, overlap forming an interlocking pattern; cones large, 1–3 together; occurring in the Bathurst and Albany districts of the Eastern Cape **E. latifrons**
21. a. Lower leaflets horizontal to the rachis and forming a V higher up **22**
b. Leaflets reflexed or curled over along the whole length of the rachis **28**
22. a. Leaflets may be reduced in size towards the base of the leaf, but no more than 1 or occasionally 2 are modified to become prickles **23**
b. Several to many leaflets reduced to prickles at the base of the leaf **26**
23. a. Leaflets overlapping for at least some of the leaf, margin entire or occasionally toothed . **24**
b. Leaflets bright green, separate and not overlapping in the top half, margin variously toothed; occurring in coastal bush from Bushmans River eastwards to near the KwaZulu-Natal border .... **E. altensteinii**
24. a. Occurring in the Limpopo Province; leaflets blue-green **25**
b. Occurring inland from Joubertina, through the districts of Humansdorp and Uitenhage, to Somerset East; leaves with a bright yellow, gracefully arching rachis ..... **E. longifolius**

25. a. Leaves not hairy or velvety; leaflets up to 20 cm long, curling over from the rachis and overlapping upwards, margin conspicuously toothed when young, entire when mature; lowermost 1 or 2 leaflets reduced to prickles; leaves more or less straight, with the rachis often twisted towards the apex; stems up to 2 m tall and 25 cm in diameter, often suckering from the base, forming clumps; cones blue-green, hairless; male cones up to 4, borne on short stalks; female cones 1 or 2 together, without a stalk; occuring on the Drakensberg in the Limpopo Province ..... **E. nubimontanus**

b. Leaves numerous in a dense crown, upright but curved over towards the end, up to 1,2 m; leaflets bluish green, 13–17 × 2–4 cm, narrowly elliptic and slightly sickle-shaped, margin entire, rachis and petiole hairy; the lowermost leaflets not reduced to prickles; stems up to 3,5–4,2 m tall with a diameter of 35–40 cm and a golden hairy crown, tending to recline and sprawl on the ground as they get older; male cones 5 together, 50 × 9 cm, on stalks 12 cm long; female cones 1–3 together, 40 × 35 cm, appearing to be without stalks as these are hidden; occurring on southeast-facing quartzite cliffs in the north of the Limpopo Province ..... **E. hirsutus**

26. a. Leaves erect to spreading, not arching or bow-shaped **27**

b. Leaves arching, bow-shaped, producing an umbrella canopy; the only known specimen from Ngoye Forest in northern KwaZulu-Natal, now considered to be extinct in the wild ..... **E. woodii**

27. a. Lowermost leaflets reduced to form numerous prickles; median leaflets not more than 2,5 cm wide, heavily toothed, overlapping and forming a pattern; occurring in the Piet Retief area, but may now be extinct in the wild ..... **E. lebomboensis**

b. Lowermost leaflets reduced to form fewer prickles; median leaflets up to 4,5 cm wide; wool forms over the crown when the new leaves emerge; widespread in KwaZulu-Natal, but not north of the Pongola River ..... **E. natalensis**

28. a. Leaflets reflexed (bending over) from the rachis but not overlapping, margin entire or occasionally toothed, veins raised and prominent below; occurring in the mountains near Barberton and on the border between Mpumalanga and Swaziland and in the area around Piggs Peak and Havelock **29**

b. Leaflets reflexed (bending over) from the rachis and overlapping, margin markedly toothed, veins not prominent below; occurring in the Soutpansberg and Letaba districts, Limpopo Province ..... **E. transvenosus**

29. a. Leaves shorter than 1,2 m; leaflets light green, markedly woolly, margin usually entire; copious amounts of brown wool on the stem, crown, cones and leaflets; male and female cones very much the same shape and size ..... **E. heenanii**

b. Leaves longer than 1,2 m, rachis yellow; leaflets dark glossy green, with about 30 prominent veins below, margin usually sparsely toothed, with moderate amounts of brown wool on the stem, crown, cones and leaflets ..... **E. paucidentatus**

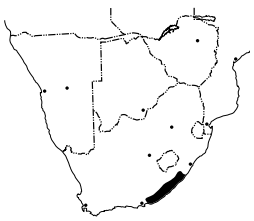
Encephalartos aemulans Vorster

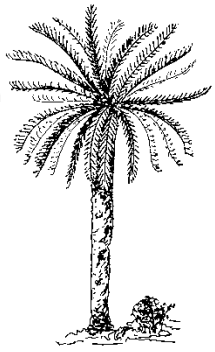
S.A. no: 14.5 **Ngotshe Cycad. Ngotshe-broodboom**

See section **12. b.** of the key.

Encephalartos altensteinii Lehm.

S.A. no: 3 **Giant Eastern Cape Cycad. Oos-Kaapse Reusebroodboom**





Stems up to 4 m, occasionally 7 m; occurring in coastal bush or on rocky hillsides. **Leaves:** 1–2 m long, fresh green; leaflets up to 15 × 2,5 cm, with 2–5 teeth along both sides of margin; lowermost leaflets not reduced to prickles; lower 15–20 cm of the petiole bare. **Cones:** in groups of 1–3, golden yellow when mature; male cones 50 × 12 cm; female cones up to 55 × 28 cm. **Seeds:** oval, about 2,3 cm long, scarlet.

This species closely resembles *E. natalensis* and *E. lebomboensis* but they have prickles down the petiole and wool forms over the crown when the new leaves emerge. Some authorities consider these three species geographical variations of one species. *Encephalartos altensteinii* also closely resembles the recently described *E. senticosus*; the differences are given in section **11** of the key.

Encephalartos arenarius R.A.Dyer

S.A. no: 3.2 **Dune Cycad. Duinebroodboom**
See section **20. a.** of the key.

Encephalartos brevifoliolatus Vorster

S.A. no: 3.3 **Escarpment Cycad. Platorand-broodboom**
See section **9. b.** of the key.

Encephalartos dolomiticus Lavranos & D.L.Goode

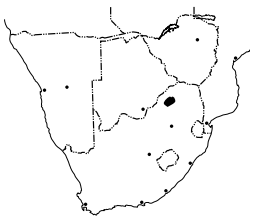
[*E. verrucosus* Vorster]
Previously known as the Wolkberg form of *E. eugene-maraisii*
S.A. no: 14.4 **Wolkberg Cycad. Wolkberg-broodboom**
See section **17. b.** of the key.

Encephalartos dyerianus Lavranos & D.L.Goode

[*E. graniticolus* Vorster]
S.A. no: 14.2 **Lillie's Cycad. Lillie-se-broodboom**
See section **17. a.** of the key.

Encephalartos eugene-maraisii I.Verd.

S.A. no: 3.1 **Waterberg Cycad. Waterberg-broodboom**

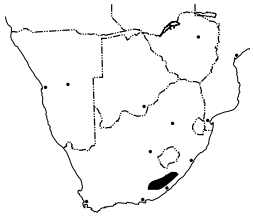


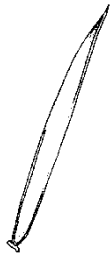
Stems up to 4 m, with a diameter of 30–45 cm; old specimens tending to sprawl and recline; infrequent on isolated mountains. **Leaves:** held horizontally to the crown, the tip curling upwards, up to 1,3 m long; leaflets silvery bluish-green, 15–20 × 1,3–1,5 cm, margin entire, or with 1 or 2 small teeth on the lower surface; the lowermost leaflets not reduced to prickles. **Cones:** 1–3 together, dark red-brown when mature; male cones up to 8 together, 20–40 × 6–8 cm, smelling unpleasant when mature; female cones 30–50 × 16–20 cm. **Seeds:** about 4 × 3 cm, light brown and known as *wildedadels*, or wild dates, locally.

This cycad was found by the naturalist, author and poet Eugène Marais, but details of its locality died with him. It was due to the efforts of his niece, Dr Inez Verdoorn, that these trees were found again and she named the species after its original discoverer.

Encephalartos friderici-guilielmi Lehm.

S.A. no: 4 **White-haired Cycad. Withaarbroodboom**



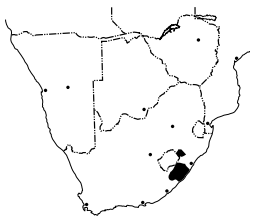


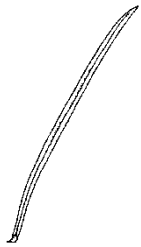
Stems up to 4 m, conspicuously stout, up to 60 cm in diameter, with a dense, brown, woolly crown; occurring on mountainsides and rocky hill slopes. **Leaves:** 1–1,5 m long, held at an angle of 45° to accommodate the large number of cones; leaflets long and narrow, up to 17 × 0,7 cm, closely spaced and overlapping, forming a V at the top, blue-green when young becoming darker with age, undersurface loosely covered with whitish woolly hairs which are later lost, margin entire; the lowermost leaflets reduced in size but not to prickles. **Cones:** densely woolly, lemon-yellow becoming tawny beige; male cones up to 12 together, 20–30 × 6–7 cm; female cones 5 or 6, 20–30 × 15–17 cm. **Seeds:** about 3 × 2 cm, yellow to orange.

This species is closely related to, and easily confused with, *Encephalartos cycadifolius* (Jacq.) Lehm., a suffrutex distinguished by having an underground stem.

Encephalartos ghellinckii Lem.

S.A. no: 5 **Drakensberg Cycad. Drakensberg-broodboom**





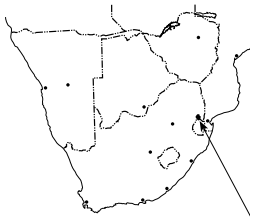
Stems up to 3 m, with a diameter of 30–40 cm and an open, brown, woolly crown; old specimens often leaning over; occurring in mountains above 700 m. **Leaves:** up to 1 m long, rachis bright yellow, spirally twisted; leaflets up to 14 × 0,4 cm, conspicuously tightly rolled under, almost needle-like, densely greyish woolly when young, losing most of these hairs later; the lowermost leaflets not reduced to prickles. **Cones:** 2–5 together, yellow at first becoming tawny beige, densely woolly; male cones 25 × 7 cm; female cones 22 × 14 cm. **Seeds:** about 2,5 × 2,5 cm, golden yellow.

The fine leaflets could lead to some confusion with *Cycas revoluta* Thunb., a Japanese species which is quite frequently seen in gardens, but the female cones of the latter are characteristic and closely resemble those of *C. thouarsii*.

Encephalartos heenanii R.A.Dyer

S.A. no: 14.1 **Woolly Cycad. Wollerige Broodboom**

Stems up to 3 m and 25–35 cm in diameter, more or less covered with woolly hairs, the leaves curling upwards into a basin-shaped crown; occurring in mountainous areas among rocks in sheltered ravines, at altitudes of 1 800 m. **Leaves:** 1–1,3 m long, slightly curved upwards; leaflets pale silver-green, densely covered with brownish woolly hairs when young, some of which persist to maturity, oblong-lanceolate, 12–15 × 1,5–2 cm, margin entire, rarely with a few small teeth, inclined to roll upwards; the lowermost leaflets not reduced to prickles. **Cones:** 1–3, usually produced laterally, stalked, densely



covered with shaggy brown woolly hairs, sub-cylindrical, up to 30 × 17 cm, male and female cones similar in size and shape but the female cones heavier.

This species is closely related to *E. paucidentatus*, which occurs in the same area; differences between the two species are given in section **29** of the key.

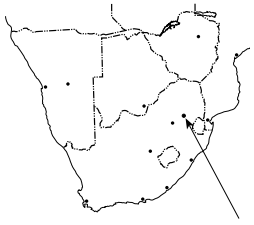
Encephalartos hirsutus P.J.H.Hurter

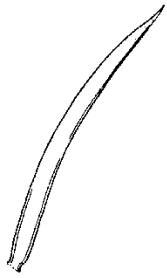
S.A. no: 14.6 **Venda Cycad. Venda-broodboom**

See section **25. b.** of the key.

Encephalartos inopinus R.A.Dyer

S.A. no: 5.1 **Lydenburg Cycad. Lydenburg-broodboom**



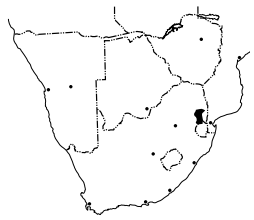


Stems up to 3 m, forming suckers from the base, the longer stems frequently reclining; occurring in a very limited area, in hot, dry valleys. **Leaves:** 1–1,5 m long, rachis yellow with a spiral twist along the axis; leaf bases swollen, densely covered with brown woolly hairs, hairless later; leaflets silvery green with a marked whitish bloom when young, especially on the undersurface, 14–20 × 0,8–1 cm, slightly sickle-shaped, margin entire or with 1 or 2 very small teeth; the middle leaflets at 90˚ to the rachis and the lower ones pointing downwards; the lowermost leaflets abruptly modified to form 2–6 pairs of short prickles. **Cones:** male cones 18–25 × 6–8 cm; female cones 30–35 × 15–20 cm, 2 or 3 together; both are the same silvery-green colour as the leaves even when mature. **Seeds:** apricot-coloured.

The diagnostic characters are said to be the slightly sickle-shaped leaflets and the lower leaflets which point downwards.

Encephalartos laevifolius Stapf & Burtt Davy

S.A. no: 6 **Kaapsehoop Cycad. Kaapsehoop-broodboom**

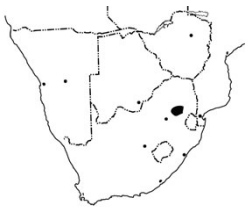


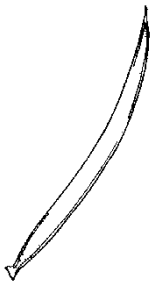
Stems up to 3 m, slender, with regularly patterned leaf bases and a crown with very little wool; occurring on exposed rocky outcrops on mountain slopes. **Leaves:** dark green, with a yellow rachis up to 1,5 m long; leaflets 12–15 × 0,5–0,7 cm, with a greyish bloom when young, horizontal to the

rachis at the bottom and pointing upwards to form a V at the top, margin entire; lowermost leaflets not reduced to prickles. **Cones:** with short, fine grey hairs, not woolly; male cones 30–40 × 10 cm, becoming curved when mature; female cones shorter, 20–30 × 10–13 cm. **Seeds:** about 2,7 × 2,3 cm, yellow.

Encephalartos lanatus Stapf & Burtt Davy

S.A. no: 5.2 **Olifants River Cycad. Olifantsrivier-broodboom**

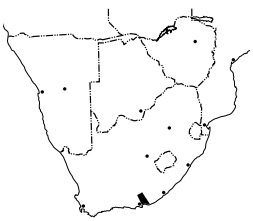




Stems up to 1,5 m, occasionally up to 2,5 m, 25–30 cm in diameter, with copious amounts of wool between the leaf bases; occurring in sheltered places in valleys along the upper reaches of the Olifants River. **Leaves:** up to 1 m long, the top third of the rachis markedly curled around; leaflets bluish green when young, green later, 10–13 × 0,6–0,8 cm, overlapping, set in a tight V formation along the entire length of the rachis, margin entire; the lowermost leaflets not reduced to prickles. **Cones:** 1–4, pale creamy yellow fading to grey, densely woolly; male cones 25–30 × 5–6 cm; female cones 25–35 × 12–15 cm. **Seeds:** up to 3 × 2,5 cm, yellow.

Encephalartos latifrons Lehm.

S.A. no: 7 **Albany Cycad. Albany-broodboom**



Stems up to 3 m, forming suckers from the base, with a woolly crown before the new leaves emerge; occurring in scrub bush and on rocky outcrops. **Leaves:** up to 1,5 m long, rachis curved with the tip bending over backwards; leaflets finely velvety when young, losing these hairs later, 10–15 × 4–6 cm, overlapping, upper margin entire, lower margin with 3 or 4 triangular, spine-tipped lobes which are twisted out of the plane of the leaflet, leaflets overlapping and forming an interlocking pattern; lowermost leaflets occasionally reduced to prickles. **Cones:** large, 1–3 together, dark olive green; male cones 30–50 × 8–17 cm; female cones up to 60 × 25 cm. **Seeds:** about 5 × 2,5 cm, bright red.

With its broad leaflets which have spine-tipped lobes, this species closely resembles *Encephalartos trispinosus* (Hook.) R.A.Dyer and *Encephalartos horridus* (Jacq.) Lehm. However, the latter two have blue-green leaves and do not reach tree size. All three species occur in the Eastern Cape. They also resemble *Encephalartos ferox* G.Bertol.,Tonga Cycad, but confusion is unlikely in the field as this species occurs in KwaZulu-Natal and Mozambique.

Encephalartos lebomboensis I.Verd.

S.A. no: 14.8 **Piet Retief Cycad. Piet Retief-broodboom**

Stems up to 4 m, with a diameter of 25–30 cm and a patchwork effect as a result the leaves having small and large leaf bases, reflecting prolonged periods of drought between wet seasons; occurring in a comparatively confined area on cliffs and in rocky river gorges. **Leaves:** 1–2 m long, forming

a dense crown, rachis strongly curved at the tip; leaflets fresh bright green, 12–17 × 1,5 cm, with 1–4 teeth on both sides of the margin forming a regular pattern; lowermost leaflets reduced to prickles; petiole densely prickled right to the base. **Cones:** yellow or salmon-pink, 1–3 together; male cones up to 45 × 13 cm; female cones up to 45 × 22 cm. **Seeds:** about 4 × 2,2 cm, bright red.

There is confusion between this species and *E. senticosus*, the latter being the widespread species on the Lebombo Mountains in KwaZulu-Natal and Swaziland, whereas *E. lebomboensis* is confined to the Piet Retief area, and may now be extinct in the wild. It is, however, widely cultivated. See section **11** of the key for the differences.

Encephalartos lehmannii Lehm.

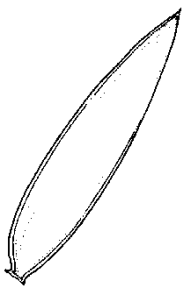
S.A. no: 8.1 **Karoo Cycad. Karoobroodboom**

Stems 1,5–2 m, with a diameter of 25–45 cm, often forming suckers from the base and frequently reclining; occurring on dry, stony hillsides in karroid scrub. **Leaves:** up to 1,5 m long, with a distinct yellow collar where the petiole joins the stem; leaflets blue-grey, 12–18 × 1,5–2 cm, held horizontally to the rachis and not overlapping in the top third, margin entire or with 1 or 2 very small teeth on the lower margin; lowermost leaflets may be reduced to 1 pair of prickles. **Cones:** solitary, dark red, with fine black hairs which are shed at maturity; male cones 25–35 × 8–10 cm; female cones 45–50 × 25 cm. **Seeds:** about 5 × 2 cm, red.

This species closely resembles *E. princeps*; see section **18** of the key for the differences, but confusion is unlikely in the field.

Encephalartos longifolius (Jacq.) Lehm.

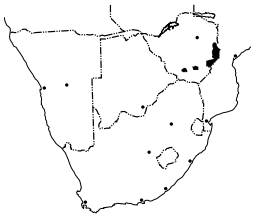
S.A. no: 9 **Suurberg Cycad. Suurberg-broodboom**

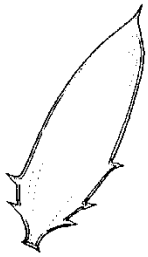


Stems up to 4 m, thickset, 30–45 cm in diameter; may be locally common on exposed mountain slopes well inland. **Leaves:** up to 2 m long, with a pale yellow, gracefully arching rachis; leaflets dark green with a grey bloom, up to 20 × 4 cm, overlapping in V formation, margin entire or with 1–3 teeth on the lower margin; lowermost leaflets may be reduced to 1 or 2 prickles. **Cones:** 1–3 together, greenish brown, with reddish flattened hairs; male cones 40–60 × 14–20 cm; female cones about 60 × 40 cm. **Seeds:** about 5 × 2,5 cm, bright red.

These cones are among the largest in the genus: a female cone weighs up to 35 kg. This species is closely related to *E. altensteinii*, but confusion is unlikely in the field as they occur in different areas. See sections **23** and **24** of the key.

Encephalartos manikensis (Gilliland) Gilliland





(Zimb. no: 7) occurred in isolated areas along the border between eastern Zimbabwe and Mozambique; now fairly common in gardens. Map shows cycads north of the Limpopo River.

Encephalartos chimanimaniensis R.A.Dyer & I.Verd. (Zimb. no: 5) is virtually extinct in the Zimbabwean part of the Chimanimani Mountains.

Encephalartos concinnus R.A.Dyer & I.Verd. (Zimb. no: 6) is still in existence in the south of the country but is threatened.

Encephalartos munchii R.A.Dyer & I.Verd. and *Encephalartos pterogonus* R.A.Dyer & I.Verd., originally both from Mozambique, now nearly extinct in the wild; there are few plants known in cultivation.

Encephalartos middelburgensis Vorster, Robbertse & S.van der Westh.
[*E. eugene-maraisii* I.Verd. subsp. *middelburgensis* Lavranos & D.L.Goode]
S.A. no: 14.3 **Middelburg Cycad. Middelburg-broodboom**
See section **16. b.** of the key.

Encephalartos msinganus Vorster
S.A. no: 14.7 **Msinga Cycad. Msinga-broodboom**
See section **12. a.** of the key.

Encephalartos natalensis R.A.Dyer & I.Verd.
S.A. no: 10 **Giant Cycad. Reusebroodboom**

Stems 3–4 m, occasionally up to 6,5 m, often forming clumps, with a diameter of 25–40 cm and a very woolly crown when the new leaves or cones emerge; occurring on krantzes and in rocky valleys, sometimes fringing forests and always some distance inland from the coast. **Leaves:** deep glossy green, large, reaching 3 m long; leaflets 15–25 × 2–4,5 cm, margin entire or with 1–5 teeth on 1 or both sides; lowermost leaflets are reduced to several prickles. **Cones:** 2 or 3 together, dark green, with a thin covering of brownish wool; male cones up to 45 × 10 cm; female cones up to 50 × 25 cm. **Seeds:** 5 × 2 cm, scarlet.

A group of these cycads grows in a kloof near the Valley of a Thousand Hills in KwaZulu-Natal. The largest tree stands about 6 m high and the age of its rootstock has been estimated at about 1000 years, while that of its stem and branches at probably more than 250 years. This specimen was declared a scientific monument in 1951.

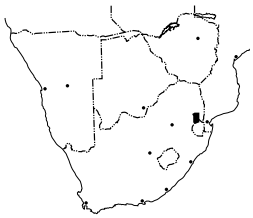
This species closely resembles *E. altensteinii*, but the latter has a bare petiole without any prickles and wool does not form over the crown when the new leaves emerge. *Encephalartos natalensis* is also similar to *E. senticosus*; the differences are given in section **27** of the key. Some authorities consider these three species geographical variations of one species.

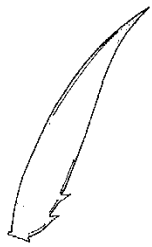
Encephalartos nubimontanus P.J.H.Hunter

[*E. venetus* Vorster]
S.A. no: 14.9 **Blue Cycad. Bloubroodboom**
See section **25. a.** of the key.

Encephalartos paucidentatus Stapf & Burtt Davy

S.A. no: 11 **Barberton Cycad. Barberton-broodboom**



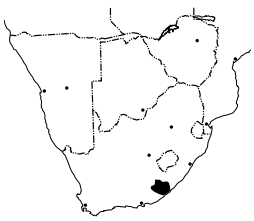


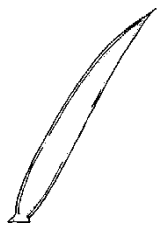
Stems up to 6 m, 40–70 cm in diameter, with large leaf bases; a rare species of forests and mountains. **Leaves:** dark glossy green with a straight yellow rachis, 1,5–2,5 m long; leaflets 15–25 × 2–3 cm, widely spaced, curling down from the rachis, about 30 prominent veins below (this is distinctive), with 1 or more small teeth on both sides of the margin; lowermost leaflets may be reduced to a few prickles. **Cones:** 1–5 together, golden brown, woolly at first; male cones up to 60 × 15 cm; female cones 35–50 × 20–25 cm. **Seeds:** about 4 × 2,5 cm, bright red.

This species is closely related to *E. heenanii*; the differences are given in section **29** of the key.

Encephalartos princeps R.A.Dyer

S.A. no: 12 **Kei Cycad. Kei-broodboom**





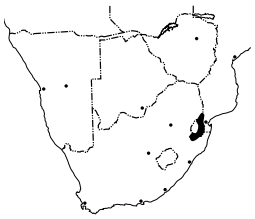
Stems up to 3 m, with a diameter of 30–40 cm, forming suckers from the base and occasionally reaching 5 m when the stems recline, as they frequently do; occurring on dolerite cliffs and rocky outcrops in karroid scrub. **Leaves:** silvery blue becoming dull green with age, thus forming a marked contrast between the old leaves and the new, 1–1,3 m long; leaflets up to 15 × 1,5 cm, spaced out along the rachis in the lower half, closely overlapping in the upper half, margin entire or with a few teeth on the lower margin; lowermost leaflets not reduced to prickles; petiole with a prominent collar at the base. **Cones:** 1–3 together, dull olive green; male cones 20–25 × 8–10 cm; female cones about 30–40 × 20–25 cm. **Seeds:** about 4,5 × 2 cm, red.

The close relationship between this species and *E. lehmannii* is described in section **18** of the key.

Encephalartos senticosus Vorster

S.A. no: 8 **Jozini Cycad. Jozini-broodboom**

See section **11. b.** of the key.

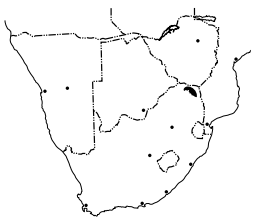


This cycad has been confused with *E. lebomboensis*, but the latter is confined to the Piet Retief area, and may now be extinct in the wild. *Encephalartos senticosus* is much more widespread, occurring on the Lebombo Mountains in KwaZulu-Natal and Swaziland. See section **11** of the key for the differences. It can be confused with *E. natalensis*, but does not occur further south than the banks of the Pongola River and *E. natalensis* does not occur north of the Umfolozi River.

When the Jozini Dam across the Pongola River was under construction, several thousand specimens of this cycad were doomed to destruction. Operation Wild Flower was organised and plants were rescued, floated across the river to safety and distributed to botanic gardens.

Encephalartos transvenosus Stapf & Burtt Davy

S.A. no: 13 **Modjadji Cycad. Modjadji-broodboom**



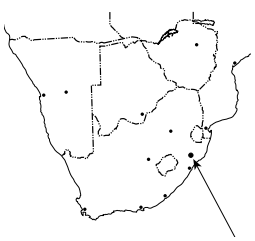
A very large cycad, stems usually 5–8 m, occasionally reaching 13 m; occurring in forests and on hillsides. **Leaves:** dark glossy green with a yellow rachis, up to 2,5 m long; leaflets 16–25 × 2,5–4,5 cm long, usually toothed on both sides of the margin; several leaflets reduced to prickles at the base. **Cones:** up to 4 cones together; male cones up to 40 × 15 cm; female cones massive, up to 80 × 30 cm, weighing up to 34 kg. **Seeds:** about 5 × 2,5 cm, bright orange-red.

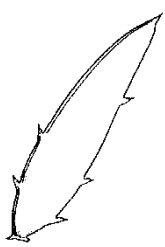
Perhaps the most famous of the southern African cycads, it is one of the largest in the world. The trees form natural forests on mountainsides in the Modjadji area near Duiwelskloof in the northeastern Limpopo Province, strictly protected by succeeding generations of Rain Queens, the hereditary rulers of the people in this region. There is little doubt that royal protection has played a part in the establishment of this unique cycad forest, for here the plants must number in their thousands. The forest was proclaimed a National Monument in 1936. These cycads also occur on the Soutpansberg.

Encephalartos woodii Sander

Illust. 1

S.A. no: 14 **Wood's Cycad. Wood-se-broodboom**





Stems up to 6 m; apparently a forest species which must now be considered extinct in its natural state. **Leaves:** up to 2,5 m, forming a dense, umbrella-like canopy; leaflets up to 20 × 5 cm long, margin toothed in young leaves, entire when mature; lowermost leaflets reduced to prickles. **Cones:** only the male cones known, bright orange-yellow, unusually large, 40–90 × 15–20 cm. **Seeds:** not known.

In 1895 Medley Wood, Curator of the Durban Botanic Gardens, found this single male cycad growing in the Ngoye forest in northern KwaZulu-Natal; the plant was 4-stemmed from the base with a few small off-shoots. As the years passed and no further specimens of this species were found, Medley Wood arranged for part of the original tree to be collected and for some of the material to be planted in Durban and some sent overseas. Years later, part of the remaining plant was found to have been mutilated, and finally, in 1916, to prevent the loss of the last remaining stem, it was removed and sent to Pretoria. The material collected has thrived, particularly that in Durban, where fine specimens can be seen.

Coniferophyta

PODOCARPACEAE (The yellowwood family)

PODOCARPUS L'Hér. ex Pers.

Evergreen trees. **Leaves:** spirally arranged, sub-opposite, whorled, or alternate. **Cones:** male cones catkin-like, axillary; female cones with scales greatly reduced and fused together with the cone axis to form a receptacle which may remain woody or become swollen and fleshy (recently the term 'podocarpum' has been applied to this unusual structure); ovules completely exposed and only slightly protected by a false aril, the 'epimatium', are produced on the receptacle; 1 or more ovules may abort so that 1 or 2 seeds are finally produced. **Seeds:** ellipsoid to globose, the false aril forming a leathery or fleshy covering.

Key to the tree species of **Podocarpus**:

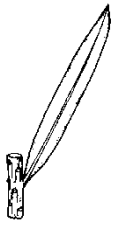
1. **a.** Leaves usually 3–6 cm long and narrower than 0,5 cm **2**
b. Leaves usually longer than 6 cm and wider than 0,5 cm **3**

2. **a.** Leaves slightly sickle-shaped, twisted at the base so that they lie vertically; seeds on scaly or leafy branchlets which do not form a swollen receptacle; bark flaking in round or rectangular pieces ..... **P. falcatus**
b. Leaves with scattered stomata or pores which lie in grooves visible to the naked eye; receptacle swollen and turning bright red or purplish; occurring in the winter-rainfall areas of the Western Cape ..... **P. elongatus**

3. **a.** Leaves more or less pendulous, gradually tapering to a narrow apex; receptacle only slightly swollen, never fleshy or brightly coloured ..... **P. henkelii**
b. Leaves held horizontally, spreading or slightly drooping, narrowly elliptic tapering to a sharp tip; receptacle swollen and turning bright red or purplish; bark longitudinally striated, flaking in narrow vertical strips ..... **P. latifolius**

Podocarpus elongatus (Aiton) L'Hér. ex Pers.

S.A. no: 15 **Breede River Yellowwood. Breederivier-geelhout**

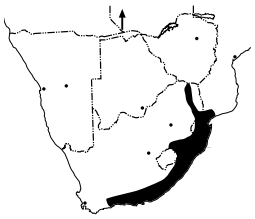


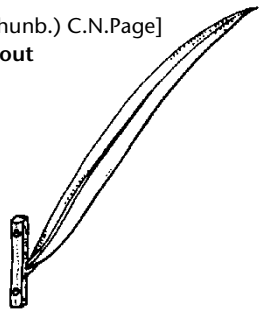
The smallest of the southern African species, usually only spreading shrubs to small rounded trees 3–6 m high as they are particularly susceptible to damage by fire, but when protected they can develop into fine trees; confined to the winter-rainfall areas of the Western Cape, favouring sandy soils, often along rivers and streams but also on exposed mountainsides where they remain small and stunted, sometimes becoming almost prostrate. **Bark:** grey to brown, longitudinally peeling in narrow strips. **Leaves:** spirally arranged to sub-opposite, usually crowded towards the ends of the branchlets, narrowly elliptic, grey-green, 3–6 × 0,3–0,5 cm, sometimes larger, with scattered stomata or pores in grooves visible to the naked eye on most leaves, particularly below; tapering to both apex and base; margin entire, slightly rolled under; petiole short. **Cones:** male cones axillary, about 2,5 × 0,3 cm; female receptacle 2-lobed, swollen, crimson red, about 10 × 10 mm (Jan.–May). **Seeds:** 1 or 2 on each receptacle, maturing rapidly to dark blue-green, oval, 7–10 mm long.

This species could be confused with *P. latifolius* where their ranges overlap, but *P. elongatus* has, on its leaves, scattered stomata or pores which lie in grooves visible to the naked eye; the stomata can be seen with a 10× lens.

Podocarpus falcatus (Thunb.) R.Br. ex Mirb

[*P. gracilior* sensu Burtt Davy, non Pilg.; *Afrocarpus falcatus* (Thunb.) C.N.Page]
S.A. no: 16 **Small-leaved Yellowwood. Outeniequa-geelhout**



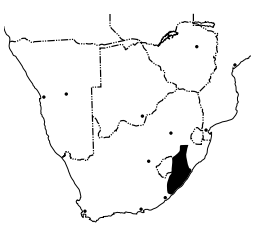


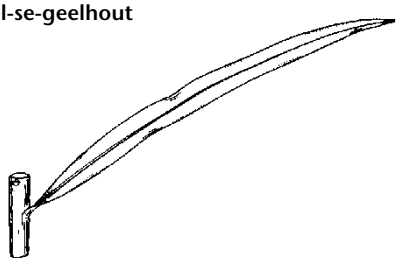
A medium-sized to large tree reaching 20–60 m in the high, moist forests of the southern Cape, but lower-growing under drier conditions; it also occurs in wooded ravines, patches of mountain forest and in coastal swamp forest. **Bark:** thin, rather smooth, greyish brown to dark brown, flaking in round or rectangular pieces; branchlets usually less than 1,5 mm in diameter near the apex, often square in section and deeply ridged. **Leaves:** spirally arranged, opposite or whorled, small, dark green, often with a greyish bloom, sometimes slightly sickle-shaped (or falcate, as described by the specific name), twisted at the base so that they are more or less vertical, hard, leathery, narrow, 3–5 × 0,3–0,5 cm; apex sharply pointed; tapering to the base; margin entire; petiole short. **Cones:** male cones axillary, small, about 10 × 3 mm; in the female structure usually 1 seed only is produced at the end of a woody stalk which is only slightly expanded at the apex (Sept.–May). **Seeds:** large, fleshy, almost spherical, about 1,5 cm in diameter, turning deep yellow and taking a full year to develop, so that seeds at some stage of development may be found on the tree throughout the year.

This is the well-known 'Big Tree' of the Knysna forest. The wood is valuable; the straight stems were used for the topmasts and yards of ships and the timber is highly esteemed in boat-building today. The tree's rate of growth is average and it is gaining in popularity as a garden subject.

Podocarpus henkelii Stapf ex Dallim. & Jacks.

S.A. no: 17 **Drooping-leaved Yellowwood. Henkel-se-geelhout**



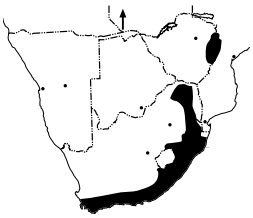


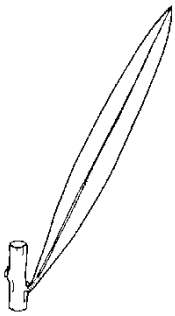
A fine, large tree up to 20 m or more in height; occurring in moist, evergreen mountain forests and, less commonly, in coastal forests. **Bark:** yellowish grey, brown or dark grey; in large specimens the bark is longitudinally fissured and peels in long, narrow strips, exposing the reddish brown underbark. **Leaves:** dark green, shiny, long and slender, up to 17 × 1 cm, drooping; gradually tapering to a narrow apex and base; margin entire and finely and tightly rolled under. **Cones:** male cones rather large, about 3 × 0,4 cm; in female cones the receptacle is not well developed and remains greenish (Sept.–Jan.). **Seeds:** large, oval, up to 2,5 × 2 cm, olive-green.

The seeds germinate easily; although the trees are rather slow-growing, they are gaining popularity as garden subjects. The species also yields a fine timber with a wide range of uses.

Dr John Henkel was formerly Conservator of Forests for Natal and northern KwaZulu-Natal and at one time Chief of the Division of Forestry in Zimbabwe. He was the author of A Field Book of the Woody Plants of Natal and Zululand, published in 1934, a work which is still frequently referred to.

Podocarpus latifolius (Thunb.) R.Br. ex Mirb. Illust. 2 and 3
[*P. thunbergii* Hook.; *P. milanjianus* Rendle]
S.A. no: 18 **Broad-leaved Yellowwood. Opregte Geelhout**
Zimb. no: 8 **Broad-leaved Yellowwood**





A large tree, 20–30 m in height; occurring in evergreen forests and patches of mountain forest and also on exposed mountainsides when it is low-growing and stunted, barely exceeding 2 m in height. Bark: yellowish brown, greyish brown to dark brown and flaking in narrow vertical strips. **Leaves:** borne more or less horizontally, thick, tough, dark green, narrowly elliptic, 6–15 × 0,5–1,3 cm; apex broadly tapering and finally sharp-tipped; narrowly tapering to the base; margin entire, rolled under; petiole short. **Cones:** male cones axillary, pinkish, large, up to 5 × 0,5 cm; female receptacle conical, fleshy, bright red, about 10 mm long (Jul.–Sept.). **Seeds:** 1 or 2, large, fleshy, oval, 1–1,5 cm, maturing rapidly (Dec.–Feb).

The receptacles and seeds are very showy and striking when a tree is bearing heavily. This is the most common and most widespread of the species. The trees yield a fine timber of a uniform pale yellow colour, which seasons and saws well, works easily and takes a good finish. It has been used more than any other indigenous timber and most of the beautiful floors in the fine old Cape homesteads were made of this wood. These trees are slow-growing but are worthwhile garden subjects; like all the species of *Podocarpus*, they will stand several degrees of frost.

*PINACEAE (The pine family)

*PINUS L.

There are no indigenous members of this family in southern Africa, but many species of *Pinus* have been introduced for their valuable soft wood. Most of these species remain in their plantations, the regeneration from seedlings being confined to these limited areas. However, some are now seriously competing with the indigenous vegetation in various areas and there is a proposal to have them all declared invaders in South Africa. They are monoecious out-crossing, not inbreeding, so if the male and female flowers are out of synchronisation or male flowers are not produced, seed is not formed.

* **Pinus canariensis** Sweet ex K.Spreng. (Canary Pine, Kanariese Den) from the Canary Isles; invades fynbos on dry mountain slopes in the southwest of the Western Cape.

* **Pinus elliottii** Englem. (Slash Pine, Basden) introduced from North America and cultivated for timber; invades forest margins and grassland in Mpumalanga, and lower-altitude, higher-rainfall areas in Zimbabwe; male flowering seems to disappear above 1500 m.
* **Pinus halepensis** Mill. (Aleppo Pine, Aleppoden) originally from Europe/Mediterranean and cultivated for shelter poles and firewood; has invaded grassland and fynbos, particularly on dry soils, and become widespread in the Eastern Cape and the Western Cape.
* **Pinus patula** Schltdl. & Cham. (Patula Pine, Treurden) introduced from east-central Mexico; now invading the natural forests in the eastern part of the region, from the Eastern Cape through KwaZulu-Natal, Mpumalanga, eastern Limpopo Province and eastern Zimbabwe and adjacent Mozambique. At lower altitudes in warmer areas the production of male and female cones appears to be out of synchronisation and so seed is not produced; needles in clusters of threes.
* **Pinus pinaster** Aiton (Cluster Pine, Trosden) introduced from the Mediterranean countries and Europe; now seriously threatening mountain and lowland fynbos in the south and southwest of the Western Cape and the Eastern Cape. It has been declared an invader in South Africa.
* **Pinus pinea** L. (Umbrella Pine, Sambreelden) from the Mediterranean countries and Europe and cultivated as an ornamental; has escaped and invaded grassland and fynbos in the southwest of the Western Cape.
* **Pinus radiata** D.Don (Radiata Pine, Radiataden) introduced from North America for timber; invades fynbos and forest gaps on damp mountain slopes near the coastal regions of the Western Cape; in eastern Zimbabwe this produces progeny, despite fungal attack, and is a potential invader.
* **Pinus roxburghii** Sarg. introduced for timber from the outer Himalayas; has a very deep tap root and is drought resistant; invading drier areas close to where it has been planted.
* **Pinus taeda** L. (Loblolly Pine, Loblollyden) introduced for timber; becoming invasive in lower-altitude, higher-rainfall areas; male flowering seems to disappear above 1500 m.

CUPRESSACEAE (The cypress family)

All the species of the indigenous genera occurring in southern Africa contain an aromatic resin which makes them particularly susceptible to fire; even a mild fire causes these trees almost to explode into flame and, once alight, they frequently burn to death.

Key to the tree genera of **Cupressaceae** (alien genera marked with an * included at the end of the key):

1. a. Mature leaves 2 mm or more in length, tightly pressed against the stem and giving the branchlets a smooth appearance; mature female cone hard, woody and dehiscent .... **4. Widdringtonia**

b. Mature leaves less than 2 mm long, not tightly pressed against the stem so the branchlets have a rough appearance; mature female cone fleshy and berry-like ..... **3. Juniperus**

1. *CALLITRIS

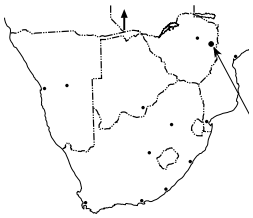
* **Callitris endlicheri** (Parl.) F.M.Bailey (Black Cypress) introduced from southeastern Australia for timber; has escaped from plantations in higher-rainfall areas in Zimbabwe and become established in woodland and even in eucalyptus plantations.

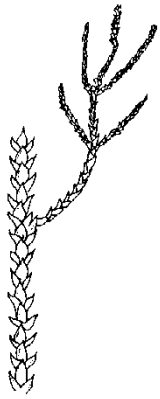
2. *CUPRESSUS

* **Cupressus lusitanica** Mill., naturalised in Europe and introduced for timber from central America; has escaped in eastern Zimbabwe.

3. JUNIPERUS L.

Juniperus procera Hochst. ex Endl.
Zimb. no: 11 **African Juniper**





A medium-sized to tall tree 10–20 m in height, but reaching 40 m in countries to the north; occurring in evergreen mountain forests between 1500 m and 3000 m. **Bark:** reddish brown, thin, flaking. **Leaves:** juvenile leaves needle-like, spreading; adult leaves very small, scale-like, leaf bases pressed tightly against branchlets, but apices spreading slightly to give a roughish appearance. **Cones:** male cones small, about 3 mm long, narrowly oval, with about 10 rounded, opposite, chunky scales, irregularly overlapping; female cones with 6–8 fleshy scales which become swollen and fuse together at maturity so that the ripe female cone has all the appearances of a fleshy, juicy, berry-like fruit, blue-black, about 6 mm in diameter, ripening Oct. **Seeds:** 1 or 2, about 5 mm long, brown, woody.

The fruits of a common European species, *Juniperis communis* L., the Juniper, were once used to flavour gin, liqueurs and cordials, but today cheaper substitutes are used. The wood is hard, durable, termite-proof and faintly scented; it is pale reddish in colour, attractive, fine-grained and takes a good finish. It is an important timber tree in Kenya. In Zimbabwe only a single specimen is known in its wild state at the present time.

* **Juniperus virginiana** L. (Red Cedar, Rooiseder) introduced from North America as an ornamental and for shade; now invading grassland, river banks and rocky outcrops, particularly along the Free State and Lesotho border. The leaves are poisonous, being toxic to stock and a skin irritant to humans.

4. WIDDRINGTONIA Endl.

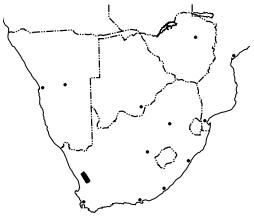
Evergreen shrubs or trees; wood fragrant. **Leaves:** juvenile leaves needle-like, spirally arranged; adult leaves scale-like, pressed tightly against the branchlets, decussate or alternate. **Cones:** sexes separate but on the same tree; male cones small, more or less 4 mm long, terminal on short spur-branchlets; female cones woody, 1,3–2,5 cm in diameter, solitary or in clusters on elongated shoots; scales few, usually 4 of equal size, rarely 5 or 6, arranged in a whorl, the scales opening to allow pollination and then closing again; each scale terminating in a thick, woody, smooth to warty face, or valve, and each with several ovules at the base. **Seeds:** ovoid with a papery wing.

Key to the tree species of **Widdringtonia**:

1. **a.** Adult leaves on end branchlets ovate; valves (or faces) of the female cones conspicuously rough and warty **2**
   b. Adult leaves on end branchlets narrowly oblong; valves (or faces) of the female cones smooth, wrinkled or only slightly warty; fairly widespread in mountain areas **W. nodiflora**
2. **a.** Seeds oval, 3-cornered; wing comparatively small; occurring in the Cedarberg, Clanwilliam district ..... **W. cedarbergensis**
   b. Seeds rather flattened with a conspicuous wing; occurring in the Willowmore district .... **W. schwarzii**

Widdringtonia cedarbergensis Marsh

S.A. no: 19 **Clanwilliam Cedar. Clanwilliam-seder**



A rare tree, usually 5–7 m in height, but in protected places up to 20 m, old trees spreading, gnarled and massive; occurring singly or in scattered groups on rocky outcrops and mountain tops. **Bark:** reddish grey, thin, fibrous and flaking. **Leaves:** juvenile leaves up to 2 × 0,2 cm; adult leaves up to 4 mm long. **Cones:** male cones very small, only up to 2 mm long; female cones almost spherical, up to 2,5 cm in diameter, with 4 scales, each with woody, rough, warty faces, dark brown; may be found on the tree at various stages of development throughout the year. **Seeds:** ovoid, narrowly winged.

This species is very similar to *W. schwarzii*, but the two species can be separated on their geographical distribution. The wood is beautiful, light yellow to whitish; it works well, takes a fine polish and is borer-proof. The pews, doors and carved altar in the Anglican church and the appointments in the Courthouse, both in Clanwilliam, show this wood at its best. In past years this species was almost annihilated by woodcutters and veld fires, but today an active planting scheme is in progress and future generations may see these fine trees re-established.

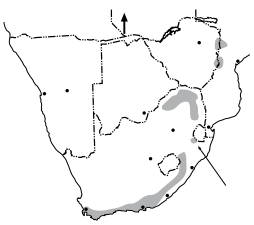
Widdringtonia nodiflora (L.) Powrie

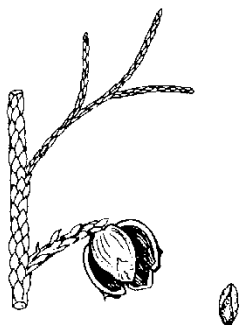
Illust. 4

[*W. cupressoides* (L.) Endl.]

S.A. no: 20 **Mountain Cypress. Bergsipres**

Zimb. no: 10 **Mountain Cedar**

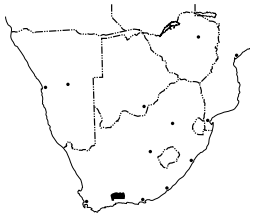




Most often a scrubby bush or small tree 4–6 m in height, but in a few remote areas in the mountains of eastern Zimbabwe much larger specimens are occasionally found; occurring at high altitudes on mountainsides, among rocks and in gullies. **Bark:** brown to grey, thinly fissured vertically and flaking in long, narrow strips revealing reddish underbark. **Leaves:** juvenile leaves needle-like, fresh green, spirally arranged, up to 2 cm long; adult leaves scale-like, about 2 mm long, dark green. **Cones:** male cones small, 2–4 mm long, terminal; female cones globose, 1,5–2 cm in diameter, dark brown, with 4 scales, each with a wrinkled surface and a few protuberances; maturing about Mar., but cones in varying stages of development may be found throughout the year. **Seeds:** dark brown to blackish, with a conspicuous reddish wing.

The name cedar, by which this genus is sometimes known, is applied loosely to a number of trees with characteristically fragrant wood, several of which, including *Widdringtonia*, yield a pleasantly aromatic oil. The timber is very durable out-of-doors and makes hard-wearing roofing shingles that weather to an attractive silver-grey. The wood has a natural satiny sheen and makes fine furniture and panelling. Unfortunately, there remain very few sizable trees south of the Zambezi River today, although the beautiful kists made in the late nineteenth century by pioneers in the Chimanimani district of Zimbabwe are evidence that large trees grew there at that time. An exceptionally fine tree is illustrated in the habit drawing (Illust. 4).

Widdringtonia schwarzii (Marloth) Mast.
S.A. no: 21 **Willowmore Cedar. Baviaanskloof-seder**



A large tree 17–30 m in height, although some fine old specimens reaching 40 m can still be found; occurring only in the low-rainfall areas of the Baviaanskloof and Kouga mountains, in rocky ravines at about 900 m. **Bark:** reddish grey, thin, fibrous, flaking. **Leaves:** juvenile leaves up to 2 cm long, needle-like; adult leaves 3–4 mm long, decussate. **Cones:** male cones very small, about 2 mm long, on dwarf spur-branchlets; female cones almost globose, about 2 cm in diameter, dark brown, the 4 scales having rough and warty faces; cones in varying stages of development can be found on the trees throughout the year. **Seeds:** somewhat flattened, with a conspicuous wing.

The occurrence of these trees tells the same sad story – all accessible specimens have been burnt or cut out and lost. Trees of any substantial size are now confined to remote rocky ravines and can be seen only with the greatest effort and determination. The similarity of *W. schwarzii* to *W. cedarbergensis* is discussed under the latter species; it also shows some affinities with *W. nodiflora* and is intermediate in many respects between the two.

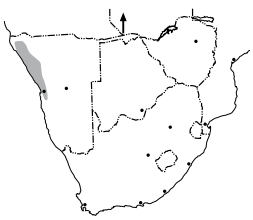
Gnetophyta

WELWITSCHIACEAE (The welwitschia family)

This family contains only a single genus and a single species.

WELWITSCHIA Hook.f.

Welwitschia mirabilis Hook.f. Illust. 5
[*W. bainesii* (Hook.f.) Carr.]
S.A. no: 21.1 **Welwitschia. Tweeblaarkanniedood**



A dwarf but massive tree driven underground by the rigours of the desert climate; the largest specimens have a stem 1,5 m in diameter rising 2 m above the ground, with 2–3 m below the ground before the very large tap-root starts; occurring in gravelly soils along dry watercourses in desert regions, even surviving in the deep, loose sand of the desert itself. **Stem:** crown flattened or saucer-shaped, dark brown, hard, woody, warty and cracked, most often forming a rock-like hump just protruding above ground level, like a large, inverted elephant's foot (see Illust. 5); around the rim of this flattened apex are 2 semicircular grooves (occasionally 3) from which the leaves grow. **Leaves:** the plant produces only 2 true leaves throughout its lifetime; these are persistent, continually growing

outwards from the base, and can be compared with tough, leathery paste as it is slowly squeezed from a gigantic tube. At the same time the ends are constantly blackened and worn away by the desert sun and searing winds, while the whole leaf blade is torn into long, thong-like shreds, resulting in a great tangled mass lying on the ground; the leaves may reach 3 m in length, while the width varies with the size of the stem, each leaf being rather less than half the circumference of the apex. **Flowers:** sexes separate; while still in the form of cones, these flowers in many ways represent a bridge between the cone-bearing plants and the flowering plants; stamens are produced in the male cones, but the ovules in the female cones are still naked, although now partly protected by 2 enveloping, scale-like segments and there is also a style-like structure; the cones, on branched structures around the rim of the stem apex, may be quite brightly coloured, the male cones salmon-pink, the female cones greenish yellow banded with reddish brown. **Seeds:** winged.

The first collections of these plants, made separately by Baines and Welwitsch in 1860, caused some confusion at Kew Gardens and two generic names were created, *Tumboa* and *Welwitschia*, and also two specific names, *bainesii* and *mirabilis*. Since then the generic name *Welwitschia* has been conserved with *mirabilis* as the specific name. These plants are certainly among the oldest in the world, for recent tests using the carbon-14 dating technique established the age of an average specimen to be between 500 and 600 years. The age of a large, old specimen has been estimated to be 2000 years or more.

ANGIOSPERMS (The flowering plants)

(Anthophyta/Magnoliophyta)

LILIOPSIDA (Monocotyledons)

POACEAE (nom. altern. GRAMINEAE) (The grass family)

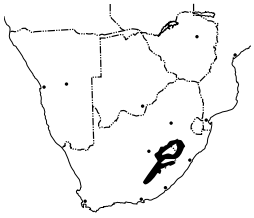
Key to the genera of 'tree grasses' or bamboos:

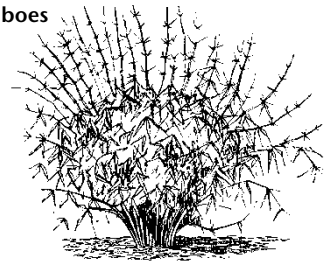
1. **a.** Stems with a substantial central cavity; if thick-walled, then veins in the leaves forming a more or less conspicuous pattern of small squares (tessellate) **2**
   b. Stems solid, or thick-walled with only a narrow central cavity; veins in the leaves not forming a conspicuous square-marked (tessellate) pattern on the surface ..... **3. Oxytenanthera**
2. **a.** Stamens 6; leaves obscurely tessellate; occurring in Zimbabwe **3**
   b. Stamens 3; leaves conspicuously tessellate; occurring at high altitudes in the Drakensberg ..... **1. Thamnocalamus**
3. **a.** Stamen filaments joined; flowerheads conspicuously spherical, spiky; found in the north and east of Zimbabwe, usually in river valleys ..... **3. Oxytenanthera**
   b. Stamen filaments free; flowerheads cup-shaped; veining on leaf surfaces very obscure; in our area known only from Mt Buchwa in Zimbabwe ..... **2. Oreobambos**

A large clump of bamboo, covering almost 0,2 ha, grows near Sibasa in the Limpopo Province but has never been known to flower, so positive identification has not been possible. It does not seem to be satisfactorily placed under *Oxytenanthera*, which has solid stems, nor under *Oreobambos buchwaldii* which is found in Zimbabwe at a locality far closer to the Limpopo Province than the nearest known colony of *Oxytenanthera abyssinica*. In the past this bamboo featured in the rites and practices of the Venda people who, observing custom and the strictest taboos, fashioned reed flutes from the stems. Each pipe produced only one single note and as a result the music created by the combined orchestra consisted of the most complex interplay of instruments, each sounding its solitary note at precisely the right moment. It is not certain whether this clump of bamboo is still being looked after.

1. THAMNOCALAMUS Munro

Thamnocalamus tessellatus (Nees) Soderstr. & R.P.Ellis
[*Arundinaria tessellata* (Nees) Munro]
S.A. no: 21.5 **Drakensberg Bamboo. Drakensberg-bamboes**



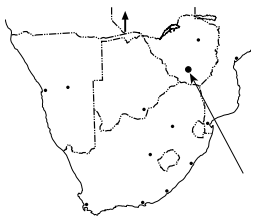


Height: 3–4 m, in dense, leafy clumps; occurring at the margins of high-altitude forest, along streams and among rocks on mountain tops. **Leaves:** at the base of the plant rather small, almost sheath-like, about 3–5 × 0,6–1 cm, in dense clusters, near the stem apex larger, up to 12 cm long; margin harsh, minutely spiny; veins on the leaf surface marking out conspicuous small squares (tessellate – a feature to which the specific name refers). **Flowers:** bisexual, enclosed in a series of specialised bracts; stamens only 3; ovary with or without hairs, styles 3, joined at the base. **Grain:** ovate to oblong.

The flowering seems to be sporadic, and the plants do not flower annually. It has been reported that they flowered in the former Natal in 1908 and again in 1953; flowering again in 1998/99 would indicate a 45-year flowering cycle.

2. OREOBAMBOS K.Schum.

Oreobambos buchwaldii K.Schum.
Zimb. no: 12 **Buchwa Bamboo**

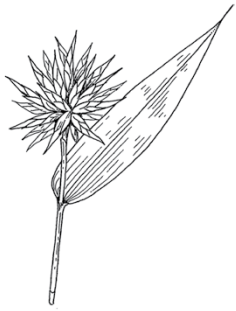


Height: 2,5–7 m, in dense clumps; only collected on Mount Buchwa in Zimbabwe, but known habitats in eastern and central Africa are clearings in evergreen forest, in swamp forest and along mountain streams. **Stems:** sheaths with fine appressed hairs at first. **Leaves:** pale green to bluish green, hairless, lanceolate to oblong, 10–35 × 2,5–6 cm; square-patterned veining on leaf surface even less distinct than on *Oxytenanthera abyssinica*. **Flowers:** bisexual, enclosed in specialised bracts forming loose, cup-shaped heads; stamens 6, free; ovary with silky hairs at the apex. **Grain:** crustaceous, with a tuft of silky hairs on the apex.

Flowers have been recorded in the National Botanic Gardens, Harare, Zimbabwe, from material collected from Mount Buchwa. In Tanzania populations are said to flower annually.

3. OXYTENANTHERA Munro

Oxytenanthera abyssinica (A.Rich.) Munro
S.A. no: 21.6 **Holy Venda Bamboo. Heilige Venda-bamboes**
Zimb. no: 13 **Bindura Bamboo**



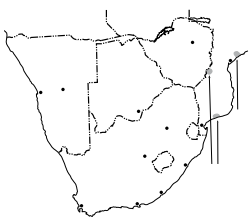
Height: 7 m or more, in dense clumps; occurring along river banks, in damp places on wooded hillsides, often associated with termite mounds. **Stems:** arching slightly near the tips; sheaths covered with short, dark brown, bristly hairs, easily rubbed off and irritating to the hands. **Leaves:** bluish green, narrowly lanceolate, 5–25 × 1–3 cm, tapering to a spine-tipped apex; sometimes the veins on the leaf surface may form a pattern of small squares, but usually these are obscure and ill-defined. **Flowers:** in 1- to 4-flowered spikes, upper flowers bisexual, lower flowers sterile; stamens 6, joined at the base; ovary hairless, styles 3, and hollow (this feature is unique). **Grain:** narrowly tapering to both ends and crowned with the persistent bases of the styles.

There is considerable evidence that each plant flowers only once in its lifetime and then dies. All the plants flower at the same time, about every seven years.

PANDANACEAE (The pandanus family)

PANDANUS Parkinson

Pandanus livingstonianus Rendle
Moz. **Screw-pine**



Height: up to 13 m, rather palm-like, the leaves and fruits making it strongly reminiscent of a tree pineapple; occurring along river banks at low altitudes. **Stem:** pale brown, raised above the ground on many sturdy stilt roots; the stem and roots spiny. **Leaves:** dark, shiny, olive-green above, paler bluish green below, hard, rigid, strap-like, 1 m or longer, arising from the apex of stems in 3 spiralling ranks (hence the common name); margin with sharp, hooked, backward-facing prickles. **Flowers:** sexes separate; male flowers in densely branched spikes, 15–20 cm long, creamy white, with conspicuous, large spathe-like bracts; female flowers in short, more compact spikes, green or cream (Oct.). **Fruit:** small, fleshy, crowded along a common axis, producing a cone-like structure about 12 × 7 cm that resembles a miniature pineapple.

It has been suggested that the population in the Musapa Gap, Chimanimani Mountains (almost on the Zimbabwe/Mozambique border), and adjacent areas in Mozambique constitutes a separate species. However, this material needs very careful comparison with the specimens of *Pandanus livingstonianus* from the areas around the Zambezi delta as they appear to be difficult to separate.

ARECACEAE (nom. altern. PALMAE) (The palm family)

Palms are widespread throughout the tropics and subtropics and are remarkably constant in their general pattern – a smooth slender stem with a crown of graceful leaves; it is not common for the stem to develop branches. Palms have the xylem and phloem in what are known as vascular bundles. As these cannot increase in size, the palms cannot grow upwards until the stem is wide enough to support both itself and the limited number of leaves it bears.

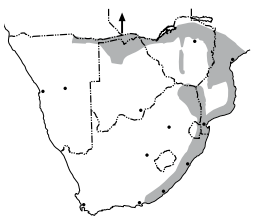
In southern Africa there are five genera and seven species occurring naturally, although many more have been introduced and cultivated.

Key to the genera of indigenous palms:

1. a. Leaves fan-shaped **2**
b. Leaves pinnate or feather-shaped **3**
2. a. Leaves, including the petiole, or stalk, 3–4 m long; fruits large, 12–18 cm in diameter ..... **3. Borassus**
b. Leaves, including the petiole, 1,5–2 m long; fruit small, 4–5 cm in diameter .. **2. Hyphaene**
3. a. Leaves 3–4 m long; fruit without scales **4**
b. Leaves very large, up to 18 m long; leaflets folding downwards (forming a roof when viewed from the top); fruit with conspicuous, thick, overlapping scales ..... **4. Raphia**
4. a. Lower leaflets reduced to spines; leaflets folding upwards (forming a valley when viewed from the top); male and female flowers on different trees; fruit oblong, fleshy, 1–1,5 cm long; widespread ..... **1. Phoenix**
b. Lower leaflets not reduced to spines; leaflets folding downwards (forming a roof when viewed from the top); male and female flowers on the same tree; fruit round, fibrous, 2 cm in diameter; confined to the northern banks of the Mtentu and Msikaba rivers in Pondoland ..... **5. Jubaeopsis**

1. PHOENIX L.

Phoenix reclinata Jacq.
S.A. no: 22 **Wild Date Palm. Wildedadelboom**
Zimb. no: 14 **Wild Date Palm**



Height: usually 3–6 m but reaching 10 m, often several-stemmed from the base, the old stems often leaning far over, curving upwards again near the apex, producing a very characteristic appearance; occurring along river banks in low-lying open grassland, and in the Okavango Delta where they are often associated with termite mounds. **Leaves:** pinnate, or feather-shaped, 3–4 m long, the lowermost leaflets reduced to spines. **Flowers:** sexes separate, on different trees; male flowers forming large, showy sprays and producing clouds of dust-like pollen, calyx cup-shaped, petals 3, stamens 6 and joined at the base, ovary vestigial; female flowers forming short, branched heads among the leaf bases, globose, insignificant, calyx cup-shaped, petals 3, rounded, ovary with 3 free carpels, 6 vestigial stamens (Aug.–Oct.). **Fruit:** ovoid, 1–1,5 cm long, green becoming bright orange when mature, thinly fleshy, edible, sweet when ripe but astringent when green (Feb.–Apr.).

The fruits resemble those of the commercial date-palm, *Phoenix dactylifera* L., but are smaller and lack the thick flesh. The true date-palms, *P. dactylifera*, are grown commercially in the Northern Cape, and there is a group growing near a spring in the Fish River Canyon in Namibia that is said to have grown from seeds thrown away by escaped German prisoners of war during World War I. In

P. reclinata there is an increased flow of sap to the flowerheads just before the flowering season and this is tapped from the flower stalk (spadix) to make an intoxicating drink.

These palms adapt to a wide range of conditions; they grow readily from seed, transplant easily and make decorative garden plants.

2. HYPHAENE Gaertn.

Height: large palm trees, often 5–7 m, but sometimes up to 18 m, single-stemmed, with a slight swelling about halfway up the stem, or suckering and forming clumps; occurring in sandy country, and beside swamps, pans and rivers; can form extensive stands. **Leaves:** fan-shaped, grey-green, 1,5–2 m long including the petiole which is armed with sharp recurved spines; the bases of the leaflets asymmetric. **Flowers:** sexes separate, on different trees; male flowers short-lived, in fairly short, tangled spikes among leaf bases, calyx 3-lobed, the lobes overlapping, petals ovate, concave, overlapping and joined at the base to form a short tube, stamens 6, ovary absent; female flowers forming large, branched sprays that develop into heavy-branched trusses of fruits, larger than the male flowers and shortly stalked, sepals ovate, overlapping and slightly shorter than the petals, ovary sub-globose, stamens absent (Sept./Oct.). **Fruit:** almost spherical or pear-shaped, 4–5 cm in diameter, orange-red to dark brown; a thin layer of sweet-tasting, ginger-flavoured, spongy, fibrous pulp surrounds the seed; within the seed the endosperm is white and bony, resembling vegetable ivory.

Elephants and baboons eat this fruit and are therefore possibly the agents for its dispersal, but it is a fallacy that the seed of the palm has to pass through their digestive systems in order to germinate. When young, the seed produces a little milk similar to that of the coconut and this is relished by rural people in Botswana and Namibia. These palms are widely exploited as a source of wine and unfortunately many are killed as a result. The tree is tapped near the growing tip but afterwards the sap hardens as it dries to form a crust over the wound and this must be cut back before a further supply can be obtained. After three or four weeks of tapping and cutting back, the growing tip will have been entirely removed and the stem inevitably dies. The wine itself is sweet and only slightly intoxicating, and though about 60–70 litres may be obtained from the average tree, this relatively innocuous liquor can be distilled to form a highly potent spirit, about two litres of which are obtained from every 20 litres of wine.

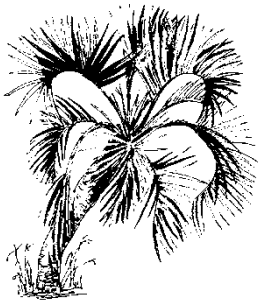
The hard white kernels of the seeds, closely resembling the commercial 'vegetable ivory' of South America, are too small to be of any economic importance, though they are often used to make ornaments, trinkets or curios.

This is a difficult palm to cultivate: the seeds do not germinate easily, the plants are very slow-growing, and the massive tap roots make it almost impossible to transplant the trees once they are established. These palms are thus rarely seen in gardens.

There are two species in southern Africa but they are very similar and in the past have been separated mainly on the shape of the fruit:

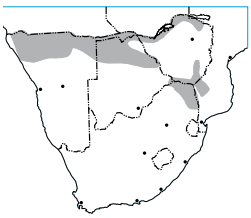
1. **a.** Fruit with a distinctly narrow base, pear-shaped; height 3–7 m; stem erect or reclining; occurring in coastal bush and grassland; the fruits are produced in large quantities, up to 2000 per tree, each taking 2 years to mature and up to 2 further years to fall, so they may be seen on the tree all year round ..... **H. coriacea**
   b. Fruit round or slightly ovoid, base not narrowed; height up to 18 m; stem erect or reclining; an inland species, found along the Zambezi River, in Botswana, Caprivi Strip, and in the south in Zimbabwe along the Save, Runde and Limpopo river valleys and in the northern part of the Kruger National Park; the fruits are produced annually ..... **H. petersiana**

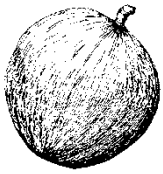
Hyphaene coriacea Gaertn.
[*H. natalensis* Kunze; *H. crinita* auctt.]
S.A. no: 23 **Lala Palm. Lalapalm**



See generic description, and for the differences between this species and *H. petersiana*, see the key.

Hyphaene petersiana Mart.
[*H. ventricosa* J.Kirk; *H. benguellensis* Welw. var. *ventricosa* (J.Kirk) Furtado]
S.A. no: 24 **Northern Lala Palm. Noordelike Lalapalm**
Zimb. no: 15 **Northern Lala Palm. Vegetable-ivory Palm**

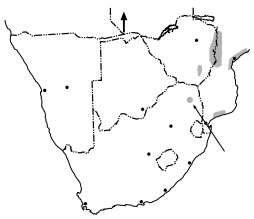




See generic description and for the differences between this species and *H. coriacea*, see the key.

3. BORASSUS L.

Borassus aethiopum Mart.
S.A. no: 25 **Borassus Palm. Borassus-palm**
Zimb. no: 17 **Borassus Palm**



Height: up to 20 m, straight bole, with a strange swelling about halfway up which is seen also in tall specimens of *Hyphaene*; occurring at low altitudes along rivers and in coastal woodland, in sandy, well-drained soil. **Leaves:** very large, fan-shaped, bluish green, up to 4 m long, including petiole which is armed with sharp black thorns; the leaflets are symmetric at the base. **Flowers:** sexes separate, on different trees; male flowers in spikes, in branched heads up to 2 m long, sepals 3, petals 3, stamens 6, ovary vestigial; female flowers larger than the male, globose, in large branched heads up to 3 m long, sepals overlapping, petals inrolled, 6 vestigial stamens, ovary globose, stigmas 3. **Fruit:** large, 12–18 cm in diameter, orange-brown, with 3 large seeds (cf. *Hyphaene* with a single seed) embedded in an edible fibrous pulp.

The Borassus Palm is very slow-growing; it may be as old as 10 or 12 years before the stem develops, while flowering possibly does not occur until the tree is 30 to 40 years old and as much

as 7 m in height. This late flowering may be linked with the swelling on the trunk which would develop at about the same stage.

Like that of *Hyphaene*, the sap is used to make wine, and though the fruit pulp is edible it is not much relished. In East Africa, however, the fruit is often eaten as are the young plants, the stems of which yield a type of starch. In Mozambique this tree serves yet another purpose, for the trunk is used to make dugout canoes.

There is a plaque on the road between Tzaneen and Leydsdorp in the Limpopo Province which marks the spot where a well-known specimen of Borassus Palm once stood. It was believed that within the swelling on its trunk the spirit of Magoeba, last chief of the Batlou tribe, was entrapped after he had been brutally murdered by the Swazis at the end of the nineteenth century. Only when the palm died were the local people satisfied that Magoeba's spirit had at last been released, though by that time his tribe was virtually extinct. There has been considerable controversy as to whether the Limpopo Province specimens are indigenous or introduced, but reference to the distribution map will show that their natural occurrence here is quite acceptable, assuming that those in southern Zimbabwe were also not introduced.

4. RAPHIA P.Beauv.

Height: stem absent or comparatively short, up to 10 m, but the vast arching leaves can give a substantive height of 28 m; this is essentially a palm of swamp areas. **Leaves:** very large, pinnate, or feather-shaped, up to 18 m long, making them the longest leaves in the plant kingdom. **Flowers:** sexes separate, both sexes being produced in a huge, branched, plume-like structure, up to 3 m long and taking 2–3 years to develop; male flowers with tubular calyx and petals, stamens 6–16, ovary absent; female flowers with calyx and corolla similar to those of the male, ovary ovoid and 3-chambered, stamens absent. **Fruit:** oblong, about 9 cm long, with conspicuous overlapping scales, shiny, polished-looking and golden-brown, 1-seeded.

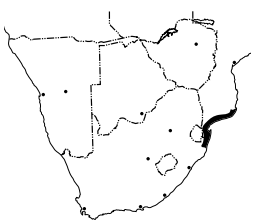
These massive and impressive palms are comparatively short-lived, for after 25 to 35 years a tree will flower, set fruit, and then start to wither. Eventually the first high wind sends it crashing down, scattering seeds over a wide area.

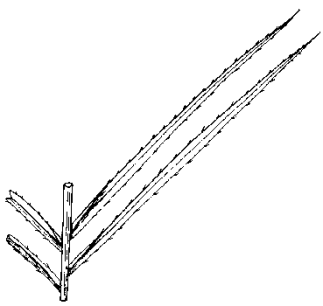
Key to the species of **Raphia**:

1. a. Flowerhead upright, carried vertically above the crown of leaves; occurring in southern Mozambique and extreme northern KwaZulu-Natal ..... **R. australis**

b. Flowerhead erect at first, later bending over and hanging down below leaves; occurring in northern and eastern Zimbabwe, adjacent areas in Mozambique and northwards .... **R. farinifera**

Raphia australis Oberm. & Strey
S.A. no: 26 **Kosi Palm. Kosi-palm**



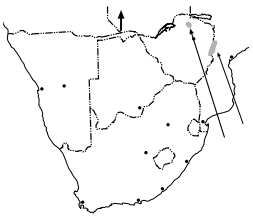
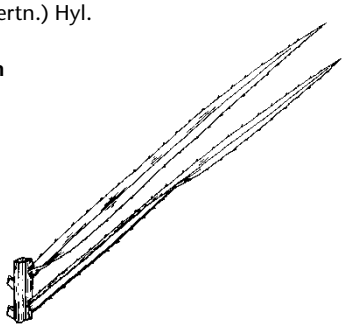


Illust. 6

These palms occur naturally in southern Mozambique and, in northern KwaZulu-Natal, only around Kosi Bay. At the beginning of the twentieth century a magistrate planted a grove of these trees at Mtunzini and later their spread in this area was encouraged by an official employed in malarial control who, in the course of his work, planted seeds wherever he thought the situation suitable. They all prospered, and today many Kosi Palms are to be seen in the Mtunzini area, although the original specimens have almost certainly all flowered, fruited and died. The grove near the railway station – the

site of the original plantings – has been declared a scientific monument and the Mtunzini population, although originally introduced and now escaped, has been included on the distribution map. The giant petioles are buoyant and in Mozambique they are used to make outriggers for canoes.

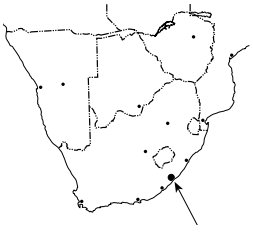
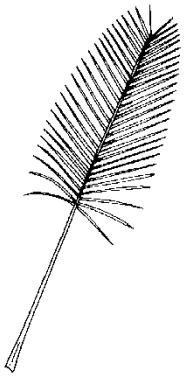
Raphia farinifera (Gaertn.) Hyl.
[*R. ruffia* (Jacq.) Mart.]
Zimb. no: 18 **Raffia Palm**


It is possible that the isolated colonies of these trees in Zimbabwe and in Mozambique may be relics of a once much wider population. The stands at the north end of the Great Dyke in Zimbabwe have been declared a Botanical Reserve and have given the name 'Palm Block' to the farming district in that area. Craftsmen have made use of the great petioles and midribs of the species of *Raphia* to fashion unique and beautiful furniture.

5. JUBAEOPSIS Becc.

Jubaeopsis caffra Becc.
S.A. no: 27 **Pondo Palm. Pondo-palm**

Height: seldom more than 5 m, although some specimens can reach 8 m; always multi-stemmed from the base; occurring only in Pondoland, lining the northern banks of the Mtentu and Msikaba rivers. **Leaves:** pinnate, or feather-shaped, 3–4 m long, very similar to the leaves of *Phoenix reclinata*, but without the spines on the leaf stem, which are conspicuous in the latter species. **Flowers:** about 1 cm in diameter; male and female flowers are separate but on the same tree in zigzag-branched sprays, or panicles, among the leaves; male flowers on the upper parts of the branches, sepals free, small and triangular, petals larger, ovate and leathery, stamens 8–16 and slightly shorter than the petals, ovary vestigial; female flowers on the lower parts of the branches, sepals broadly overlapping, petals overlapping, stamens vestigial, ovary ovoid. **Fruit:** almost spherical, about 2 cm in diameter, resembling a miniature coconut with its fibrous coating and hard centre or endocarp.

A small quantity of milk and a white 'meat' are produced by the fruits which, in smell and taste, closely resemble little coconuts and are greatly relished by children, even though each one is scarcely a mouthful. Graceful miniature palms can be propagated from the seed, which is in great demand in America. Indeed, the plants have become so popular there that almost certainly more specimens are now growing in the United States than in South Africa.

ALOACEAE (The aloe family)

ALOE L.

In the older literature this genus was considered part of Liliaceae and has also been treated as part of Asphodelaceae. In the recently published Flora Zambeziaca (2001) Vol 12.p1–3 it has been placed in its own family Aloaceae. Guide to the Aloes of South Africa (1996) by Ben-Erik van Wyk & Gideon Smith, has been used during the updating of this genus.

Plants more or less succulent, herbaceous, shrubby to tree-like, unbranched or occasionally branched. **Leaves:** long, narrow, fleshy, the base clasping the stem; margin with or without teeth, veining parallel, arising as a closely packed head at the apex of the stem. **Flowers:** in spikes, unbranched or branched, terminal or lateral; bisexual, sepals and petals alike and petaloid forming the perianth; perianth parts 6, tubular, brightly coloured from cream to yellow through to orange and red; stamens 6, in 2 whorls; ovary ovate, 6-grooved, style thread-like.

There are approximately 150 aloe species in southern Africa, of which only a few develop a conspicuous stem of any size and can therefore be considered as trees. These larger aloes are of two distinct types: those with a main stem and conspicuous branches and therefore truly tree-like, and those with a single upright stem, most often unbranched. Many of the aloe species hybridise readily with one another and hybrids are frequently found in their natural state. This can certainly create complications when one is trying to identify material.

In the following key, the inflorescence has frequently been used as a distinguishing character. Although the flowers themselves are open only for a short period, the inflorescence takes some time to develop and then to dry off; often the dry inflorescences can still be seen on the ground long after the flowers are over.

Key to the 'tree' species of **Aloe**, including those forms with a single upright stem:

A. WESTERN CAPE and NORTHERN CAPE as far south as Clanwilliam and Calvinia, NAMIBIA and adjacent northwestern BOTSWANA

1. a. Stout, several- to many-stemmed trees or bushes, 2–9 m in height **2**
b. Single upright stem, unbranched, or with 2 short branches, usually up to 2 m in height .. **4**

2. a. Stem large, up to 3 m in height, main branches heavy and ascending, reaching a total of 5–9 m in height **3**
b. Main stem very short, barely reaching 60 cm in height, multi-branched, the whole plant forming a spreading, bushy mass, 2–3 m high; flowers bright yellow ..... **A. ramosissima**

3. a. Branches spreading, forming a dense rounded crown; tree very thickset, seldom more than 5 m in height; leaves spreading to upright in rather sparse rosettes, bluish green to yellow-green; flowerheads upright, borne above the leaf rosette; flowers bright yellow (Jun./Jul.); widespread in the Northern Cape and well into Namibia ..... **A. dichotoma**
b. Branches upright rather than spreading, generally more slender and taller than the previous species, up to 10 m in height; leaves grey-green to brownish, curving over and drooping downwards, not upright; flowerheads hanging down, produced below the leaf rosette; flowers yellow (Oct.); very limited distribution in inaccessible areas of the Richtersveld and only just entering Namibia ..... **A. pillansii**

4. a. Occurring in the Cape Northern and Western Cape, not recorded further north **5**
b. Occurring in Namibia, Botswana, Limpopo Province, Zimbabwe and Mozambique, not recorded from further south; single upright stem, unbranched; leaves erect; flowerheads branched; flowers bright red (Jan.–Aug., mainly Mar.) ..... **A. littoralis**

5. a. Namaqualand only, from Orange River in the north to Vanrhynsdorp in the south; leaves erect, with a few scattered white spots particularly below; flowerheads branched, flowers orange-red (Jun./Jul.) ..... **A. khamiesensis**
b. Vanrhynsdorp, Clanwilliam to Calvinia only; leaves spreading to upstanding; flowers in single spikes, unbranched, remarkably long, up to 2 m; flowers bicoloured, buds rose-pink, open flowers creamy white (Dec.) ..... **A. comosa**

B. Southern WESTERN CAPE

Confined to a mountainous area from Elandskloof to the Franschhoek Mountains; plants 3–5 m high, many-branched; leaves very distinctive, grey-green, with a minutely toothed margin, arranged not in rosettes but in upstanding fans at the ends of the branches; flowers scarlet (Aug.–Oct.) . **A. plicatilis**

C. KAROO REGIONS, WESTERN CAPE, EASTERN CAPE, FREE STATE and LESOTHO

1. a. Plants always many-branched; leaf rosettes at the ends of the branches **2**
b. Plants with a single upright stem; if branched then shortly so and limited to 2–5 branches; leaf rosettes forming a dense cluster **3**

2. a. Large tree 10–18 m in height, with heavy branches; leaves dark green, long and narrow, in dense rosettes ..... **A. barberae**
b. Spreading bush to small tree, 2–3 m high, occasionally reaching 4 m, branches slender, naked, the old dry leaf remains persisting only just below the rosette; leaves bluish to greyish green ..... **A. arborescens**

3. a. Single-stemmed, the whole stem bearded with dry leaf remains to ground level, or nearly so **4**
b. Single-stemmed, bearded with dry leaf remains over upper half only, lower half of the stem bare ..... **A. pluridens**

4. a. Leaves with few to many spines **5**
b. Leaves without spines except around the margin; rosette of leaves untidily arranged and often tilted to one side; flowerhead a single spike, unbranched, thickset, about 30 × 12 cm; the buds red, the open flowers greenish white and the protruding stamens brownish orange, giving a tricoloured effect ..... **A. speciosa**

5. a. Leaves upright or spreading or some slightly curving downwards, flattish in cross-section **6**
b. Leaves curving over and downwards, giving a drooping effect, deeply U-shaped in cross-section; flowerhead branched, individual spikes short and squat, 25 × 10–12 cm; buds greenish orange, open flowers lemon-yellow; strictly confined to a coastal belt in KwaZulu-Natal, only just entering the Eastern Cape ..... **A. thraskii**

6. a. Leaves strongly upstanding, even the lowermost leaves curving upwards; both surfaces of the leaves usually with many strong spines; flowerhead branched, individual spikes long and slender, 50–80 × 9–12 cm; flowers scarlet; widespread in the drier parts of the Western Cape, Eastern Cape and southern KwaZulu-Natal and just entering the Free State and Lesotho..... ..... **A. ferox**
b. Leaves spreading, uppermost ones almost horizontal, lower ones hanging straight down; flowerheads branched, individual spikes long and slender, 40–60 × 10–12 cm; flower buds dull red, open flowers yellow-orange; confined to a small area roughly in the triangle between Humansdorp, Bedford and Port Alfred ..... **A. africana**

D. KWAZULU-NATAL, SWAZILAND and extreme southern areas of MOZAMBIQUE

1. a. Plants always distinctly branched, mature plants more than 2 m high **2**
b. Plants with a single upright stem; if branched, then branches short and somewhat obscure (1 species may be branched but it then forms a sprawling mass less than 2 m high) **3**

2. a. Large tree, 10–18 m in height; branches massive; old dry leaves not persistent; leaves dark green; flowerheads branched, individual spikes 20–30 × 8–10 cm; flowers rose-pink (occasionally orange) ..... **A. barberae**
b. Bush to small tree, 2–4 m high; branches slender; old dry leaves persisting only just belowthe leaf rosette; leaves blue-green or grey-green; flowerheads usually unbranched, spike squat, 20–30 × 10–12 cm; flowers coral-pink to scarlet ..... **A. arborescens**

3. a. Leaves dull green, grey-green or reddish, edged with red to reddish brown teeth **4**
b. Leaves gracefully recurved, pale green, edged with pinkish white teeth; flowerheads with 4 spikes ..... **A. pluridens**

4. a. Both surfaces of leaves without prickles **5**
b. Leaves with undersurface, or both surfaces, with a few to many prickles, along the median line or scattered **6**

5. **a.** Single-stemmed, unbranched, 3–6 m, occasionally 7 m high; stem bearded with old leaves over the upper third only; flowerhead branched, with 15 or more spikes ..... **A. rupestris**
   b. A short, single-stemmed aloe, up to 2 m in height, the stem bearded with old dry leaves, or may be branched when it forms a low, sprawling bush (this latter is usually the form seen in KwaZulu-Natal); flowerheads unbranched, spikes simple but with more than 1 from each rosette of leaves ..... **A. spicata**
6. **a.** Leaves with only sparse prickles on the surface; flowerheads branched, individual spikes upright not horizontal or tilted **7**
   b. Leaves with conspicuous prickles on both surfaces, but particularly below, toothed around the margin; flowerheads branched, spikes conspicuously horizontal or tilted at a slight angle ..... **A. marlothii**
7. **a.** Leaves not conspicuously U-shaped and not drooping downwards; flower spikes 5–12 per head, uniform orange-red or scarlet; occurring in a variety of habitats ..... **A. ferox**
   b. Leaves conspicuously U-shaped, curving over and drooping downwards; flower spikes 15–25 per head, uniform yellowish orange with protruding orange stamens; always occurring on sand dunes near the beach ..... **A. thraskii**

E. LIMPOPO PROVINCE and MPUMALANGA

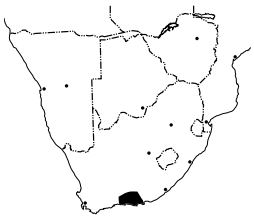
1. **a.** Plants always distinctly branched, with the branches rebranching **2**
   b. Plants with a single upright stem; if branched the branches short and rather obscure, producing little more than a cluster of leaf rosettes (1 species may be many-branched but it then forms a low, sprawling mass less than 2 m high) **4**
2. **a.** Bushes or small trees up to 4 m in height; leaves bluish green; flowerheads unbranched simple spikes **3**
   b. Large tree, 10–18 m in height; branches massive; old dry leaves not conspicuous; leaves dark green; flowerheads branched; flower spikes short, about 25 × 8–10 cm, rose-pink (occasionally orange) ..... **A. barberae**
3. **a.** Branches slender, numerous, generally bare; old dry leaves persisting just below the leaf rosette only; flower spikes short and squat, 20–30 × 10–12 cm, usually coral-pink to scarlet; nectar not obvious ..... **A. arborescens**
   b. Branches thickset, short, not numerous (seldom more than 20), densely bearded with old dry leaves for most of their length; flower spikes very long and snake-like, up to 1 m long; flowers reddish brown, producing copious dark-coloured nectar ..... **A. castanea**
4. **a.** Stems bearded with old dry leaves only over the upper half **5**
   b. Stems bearded with old dry leaves over more than half their length or to ground level **6**
5. **a.** Leaves with prickles on both surfaces, but particularly below, toothed around the margin; flowerheads branched, spikes conspicuously horizontal ..... **A. marlothii**
   b. Leaves without prickles on either surface, toothed around the margin; flowerheads branched, spikes upright, not horizontal ..... **A. angelica**
6. **a.** Leaves without scattered prickles on either surface **7**
   b. Leaves spreading and curving downwards, with scattered prickles at least on the undersurface; stems bearded with old dry leaves for about three-quarters of their length, the lower quarter often bare; flowerheads branched ..... **A. excelsa**
7. **a.** Leaves spreading or upright, not curving over and down; flower spikes not bicoloured green/yellow **8**
   b. Leaves curving over and downwards, the leaf tips even touching the main stem, bright green with a reddish border; flower spikes long and slender, strikingly bicoloured with the buds green and the open flowers yellow ..... **A. alooides**
8. **a.** Leaves without white spots, can be reddish; flowerheads unbranched, spikes simple **9**
   b. Leaves with small white spots, particularly below; stems completely bearded with old leaves to ground level; flowerheads branched ..... **A. littoralis**
9. **a.** In frost-free, hot, hilly areas; leaves spreading, often reddish to reddish green; leaf rosette open ..... **A. spicata**
   b. In high mountain areas, on mountain tops, frequently in the mist-belt; leaves upright, tending to curve inwards, often turning reddish in winter; leaf rosette compact ..... **A. dolomitica**

F. ZIMBABWE and MOZAMBIQUE

1. **a.** Plants with a single upright stem **2**
   b. Plants distinctly branched, branches slender, forming a many-branched bush or small tree 2–3 m high ..... **A. arborescens**
2. **a.** Plants not confined to the Chimanimani Mountains; stems bearded for more than half their length **3**
   b. Plants confined strictly to the Chimanimani Mountains; stem bearded with old dry leaves over the upper half only ..... **A. munchii**
3. **a.** Leaves without scattered prickles on either surface **4**
   b. Leaves spreading and curving downwards, with scattered prickles at least on the undersurface; stems bearded with old dry leaves for about three-quarters of their length, the lower quarter often bare; flowerheads branched ..... **A. excelsa**
4. **a.** Stems completely bearded with old dry leaves to ground level; leaves upright, with small white spots particularly below; flowerheads branched ..... **A. littoralis**
   b. Leaves often reddish to reddish green; flowerheads unbranched, up to 5 single spikes per leaf rosette ..... **A. spicata**

Aloe africana Mill.

S.A. no: 28.2 **Uitenhage Aloe. Uitenhaag-aalwyn**

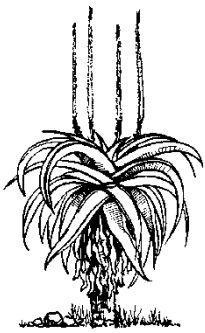


Height: up to 4 m, unbranched, the stem densely bearded with old dry leaves; occurring in dense bush. **Leaves:** spreading, uppermost ones almost horizontal, lower ones hanging straight down, dull green, edged with strong reddish teeth and a few reddish spines over the upper surface. **Inflorescence:** in branched heads, 2 or 3 heads per leaf rosette, flower spikes 40–60 cm long, tapering to the top, buds dull red, open flowers curving upwards, bright yellow-orange (Jul.–Sept.).

Aloe alooides (Bolus) Druten

[*A. recurvifolia* Groenew.]

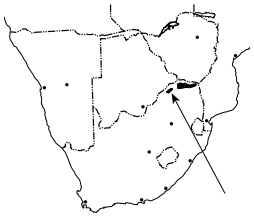
S.A. no: 28.3 **Graskop Aloe. Graskop-aalwyn**



Height: 1–2 m, unbranched, the stem bearded with old dry leaves for three-quarters of its length; occurring on rocky, mainly dolomite outcrops and ledges in the high mountains of the northern Drakensberg. **Leaves:** long and narrow, curving over and down so that the tips touch the stem, upper surface channelled, bright green with margin reddish with reddish teeth curved forward. **Inflorescence:** flowerheads unbranched, simple spikes, 3–5 per rosette, long and sinuous, up to 80 cm long, bicoloured, the buds green, the open flowers bright yellow, cup-shaped rather than tubular (Jul./Aug.).

Aloe angelica Pole-Evans

S.A. no: 28.4 **Wylliespoort Aloe. Wylliespoort-aalwyn**



Height: 3–4 m, stem usually single, occasionally branched, especially when growing in exposed places, stem bearded with old dry leaves over the upper half only; occurring on rocky slopes and in patches of dense bush on the northern faces of the Soutpansberg and Blouberg. **Leaves:** those at the top of the rosette spreading out horizontally, the lower ones curving over and down, green with a reddish brown tinge, edged with strong reddish teeth, surfaces smooth, without prickles. **Inflorescence:** flowerheads branched, 1 per leaf rosette; spikes very short, almost spherical, about 8–10 cm long and broad, strikingly bicoloured, buds red, open flowers yellow, distinctly tubular, protruding stamens yellow to orange (Jun.).

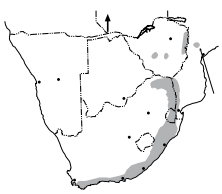
These plants do not cultivate well, but if cultivation is attempted the plant is best grown where the stems are well protected from both cold and heat.

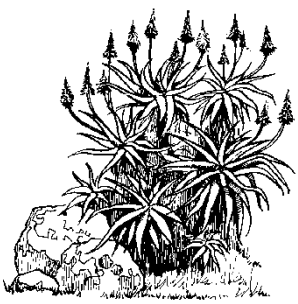
Aloe arborescens Mill.

Illust. *7*

S.A. no: 28.1 **Krantz Aloe. Kransaalwyn**

Zimb. no: 19 **Mountain Bush Aloe**





Height: usually 2–3 m (rarely 4 m), a many-branched bush or small tree, branches slender, the old dry leaves persisting just below the leaf rosette only; occurring mainly in high, hilly or mountainous areas, but over its great range it has adapted to many different habitats. **Leaves:** rather small and narrow, bluish or greyish green, with conspicuous pale teeth along the margin. **Inflorescence:** flowerheads 2–4 per leaf rosette, usually in unbranched, simple triangular-shaped spikes, rather short and compact, 20–30 cm × 10–12 cm, coral-pink to bright orange-red (May–Jul.).

Aloe mutabilis Pillans, which branches from the base and has stems rarely exceeding 1 m, is sometimes considered a highveld form of *A. arborescens*. It occurs on the inland mountains of the Waterberg and Magaliesberg, and on the Witwatersrand.

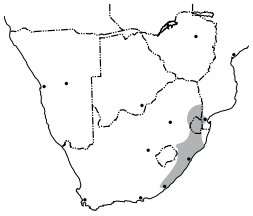
In the Eastern Cape this plant is frequently used for hedges as is shown in the photograph. A pulp produced from the leaves has proved effective in treating X-ray burns.

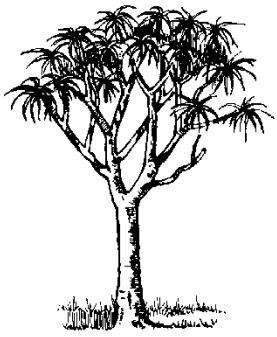
Aloe barberae Dyer

[*A. bainesii* Dyer]

S.A. no: 28 **Eastern Tree Aloe. Oostelike Boomaalwyn**

Height: a true tree, 10–18 m, with massive branches forming a well-rounded crown, this is the largest of all the species of *Aloe*; over its fairly extensive range it is found in its natural state in dense bush, forested ravines and rugged mountainsides, all with a high annual rainfall. **Bark:** greyish brown, rough to the touch. **Leaves:** long and narrow, up to 90 × 9 cm, arching over and downwards,



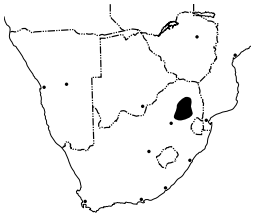


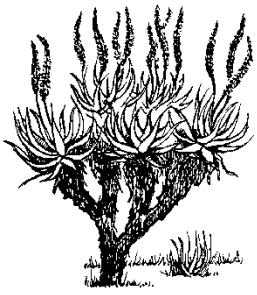
dull, dark green with a pale margin with white, brown-tipped teeth. **Inflorescence:** flowerheads branched, upright, short spikes, 20–30 × 8–10 cm, rose-pink to orange, buds tipped with green (Jun.–Aug.).

These plants strike readily from cuttings and grow well in cultivation.

Aloe castanea Schonland

S.A. no: 28.6 **Cats-tail Aloe. Katstertaalwyn**



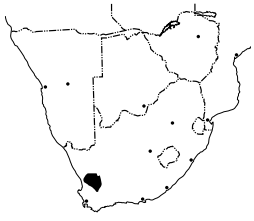


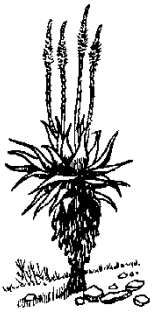
Height: 3–4 m, branched, often from near the base, and then rebranching with thickset branches which are densely bearded; the main stem is usually bare; occurring on wooded hill slopes and in open hilly grassland. **Leaves:** forming a dense rosette, bluish green edged with a fine brownish red line and small reddish teeth. **Inflorescence:** flowerheads unbranched simple spikes, very long and snake-like, up to 1 m long, up to 5 per leaf rosette; flowers cup-shaped rather than tubular, densely packed, reddish brown, producing copious dark-coloured nectar (Jun.–Aug.).

This species can grow well in gardens but it should be given a warm, sheltered position. The ash produced by burning the dry leaves is used to keep weevils out of grain.

Aloe comosa Marloth & A.Berger

S.A. no: 28.7 **Clanwilliam Aloe. Clanwilliam-aalwyn**





Height: up to 2 m, single-stemmed, bearded with the old dry leaves; occurring in a very restricted area, in hot, dry river valleys and on rocky, stony hill slopes. **Leaves:** large, broad, 65 × 12 cm, spreading to upstanding, blue-green tinged with brownish pink; margin pale pink with small reddish brown teeth. **Inflorescence:** flowerheads unbranched, simple spikes, very long, up to 2,5 m in length, 3–5 rising from each leaf rosette, strikingly bicoloured, the buds dull pink and pressed upright against the flower stem, the flowers opening pinkish ivory to whitish, turning and becoming

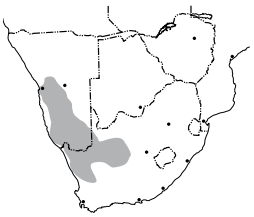
pendulous, facing downwards and still pressed tightly against the flower stem, with distinctive hairy bracts between the young flowers (the specific name refers to these) (Dec./Jan.).

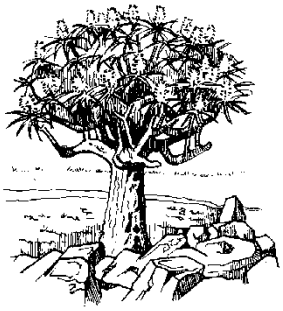
These plants do not thrive under cold conditions.

Aloe dichotoma Masson

Illust. 8

S.A. no: 29 **Quiver-tree. Kokerboom**





Height: usually 3–5 m, occasionally reaching 7 m; this is a thickset and massive aloe with the stem up to 1 m or more in diameter at ground level but tapering above this and branching and rebranching from approximately halfway up (the specific name refers to the type of branching); occurring in desert and semi-desert areas, on and among rocky hills, where they are a conspicuous feature of the landscape. **Bark:** smooth, occasionally flaking and frequently folded like melting wax, ochreous; the bark on the branches is pearly grey. **Leaves:** smallish, about 35 × 5 cm, bluish green or yellowish green to brownish, with a very narrow, yellowish brown margin and fine, yellowish brown teeth which almost completely disappear on old leaves; forming rather sparse rosettes in a fairly dense, rounded, compact crown. **Inflorescence:** flowerheads branched; flower spikes rather short, about 30 cm long, canary-yellow, upright above the leaf rosettes (Jun.–Aug.) (cf. *A. pillansii*).

It was Simon van der Stel who, in 1685, first recorded this fascinating and distinctive tree. He noticed, too, that Bushmen skilfully fashioned quivers for their arrows from the soft branches, and this custom gave rise to the name kokerboom, or quiver-tree, by which it has been known ever since. Landmarks in the blistering, stony desert country where they grow, these trees frequently drew comment from early travellers and explorers, and to this day are among the best known species in Africa and of unfailing interest to tourists. Swarms of birds and locusts are attracted to their copious nectar, and baboons tear the flowers apart to reach the sweet liquid, often stripping a tree of its blossom within a very short time.

As can be expected, *A. dichotoma* does not survive well in cold or damp areas.

Aloe dolomitica Groenew.

S.A. no: 29.1 **Dolomite Aloe. Wolkberg-aalwyn**

Height: up to 2,5 m, stem unbranched and heavily bearded with old dry leaves which are broad at the top of the stem and taper to a narrow base, giving the appearance of a shaggy spinning top; occurring on high mountain slopes and on rocky dolomite formations, in the mist-belt above 1500 m. **Leaves:** curving upwards and inwards, thick, dark green with a reddish brown margin bearing pungent teeth. **Inflorescence:** flowerhead an unbranched simple spike, several arising from the single leaf rosette; flowers cup-shaped rather than tubular, yellow or greenish yellow (Jul./Aug.).

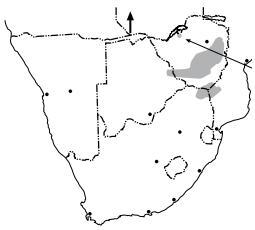
Some authorities include this species under *Aloe vryheidensis* Groenew., which has a procumbent stem, rose-coloured flowers 18–20 mm long and an ovary with three pale red stripes, a unique

feature. *A. dolomitica*, however, has a much more upright habit, and the flowers are greenish yellow and no more than 12 mm long. *A. vryheidensis* occurs in the Vryheid district in KwaZulu-Natal and *A. dolomitica* in the Limpopo Province in the Wolkberg, Strydepoortberg, Waterberg and at the base of the Kranzberg, usually on dolomite. There is one small population near Barberton where every possible intermediate can be found, and it was on this population that the decision to make them one species was based. Knowing how easily aloes hybridise, it is very possible that that is what has happened there. For this reason *A. dolomitica* has been maintained as a separate species in this work.

These plants require an alkaline soil to succeed under garden conditions.

Aloe excelsa A.Berger

S.A. no: 28.8 **Zimbabwe Aloe. Zimbabwe-aalwyn**
Zimb. no: 20 **Excelsa**



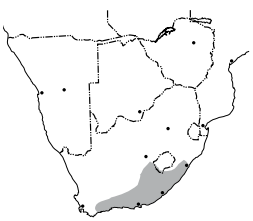
Height: 2–4 m, the single stem densely bearded with old dry leaves, but not quite to ground level, the lowermost section being bare; occurring in warm areas, in wooded grassland, and very frequently on rocky outcrops and among rocks on koppies and hills. **Leaves:** dark green, large, spreading, the lower ones drooping; margin reddish brown, with pungent teeth; there are usually prickles on the lower leaf surface, particularly near the apex. **Inflorescence:** flowerheads branched, each spike short and densely flowered; flowers orange to dark crimson-red (Jul.–Sept.).

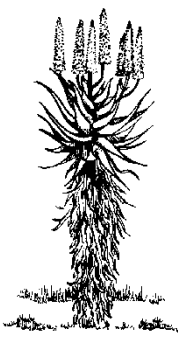
Dr Reynolds described this as 'a noble plant'. It is not difficult to germinate from seed and does well in cultivation in frost-free areas.

Aloe ferox Mill.

Illust. 9

[*A. candelabrum* A.Berger]
S.A. no: 29.2 & 28.5 **Bitter Aloe. Bitteraalwyn**





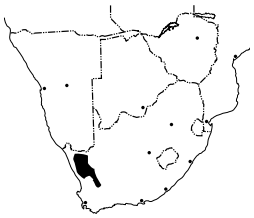
Height: 2–3 m, may be up to 5 m, the single stem densely bearded with old dry leaves; occurring in bush scrub and on open hill slopes, but over its wide range both climatic conditions and its habitats vary considerably. **Leaves:** forming a rather compact rosette, dull green edged with stout brownish red teeth; both surfaces sometimes smooth but usually with a few, and often many, scattered prickles (the specific name, meaning 'fierce', refers to this). **Inflorescence:** flowerheads branched, 1 per leaf rosette; flowers in long, dense, erect spikes, uni-coloured scarlet, although occasionally white forms occur, tips of the inner perianth lobes (or petals) brown or white, producing copious nectar (May–Oct.).

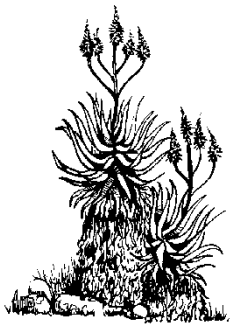
Of all the aloes, *A. ferox* was probably the first to be illustrated for it features at least twice in Bushman paintings on the rock walls of caves. Its fleshy leaves have several practical uses: in times of drought and famine farmers have used them to provide fodder for their stock; they are said to make an excellent jam which resembles the traditional Cape preserve, watermelon *konfyt*; and the drug

'Cape Aloes', which is obtained from them, is an effective laxative. The leaves are often dried and burned to repel insects, and the stockades of *A. ferox,* which are planted around cattle kraals, form a characteristic and attractive feature of rural areas. The dry leaves of the KwaZulu-Natal form are burned and the ash used as snuff. This is one of the most widely distributed species of the 'tree' aloes.

Aloe khamiesensis Pillans

S.A. no: 29.3 **Namaqua Aloe. Namakwa-aalwyn**





Height: up to 3 m, single-stemmed, or separating into 2 branches from about the middle, densely bearded with old dry leaves; occurring in the dry, hot, stony mountains of Namaqualand. **Leaves:** spreading and curving up then outwards, forming a rather open rosette, dull green, comparatively long and narrow, about 40 × 8 cm, with a few scattered white spots particularly below; margin reddish brown, armed with sharp teeth. **Inflorescence:** flowerheads large, branched, upright, each with 4–8 dense, pointed spikes; flowers orange-red tipped with greenish yellow (Jun./Jul.).

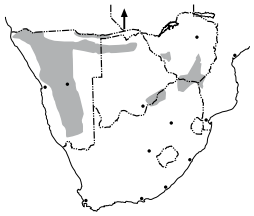
These plants do not tolerate a change in environment.

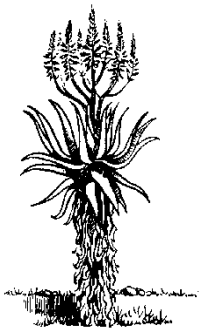
Aloe littoralis Baker

[*A. rubrolutea* Schinz]

S.A. no: 29.4 **Mopane Aloe. Mopanie-aalwyn**

Zimb. no: 21 **Mopane Aloe**





Height: up to 3,5 m, the single stem densely bearded with old dry leaves over its entire length (cf. *A. excelsa*); occurring in flat lowveld woodland, mopane woodland and extending into miombo woodland. **Leaves:** erect, not hanging downwards (cf. *A. excelsa*), greyish green, about 60 × 12 cm at the base, with white spots, but more conspicuously below; margin armed with sharp, light brown teeth which arise from small white spots above. **Inflorescence:** flowerheads branched; flowers in sparsely flowered, pointed spikes, rose-red, the tips of the perianth lobes turning yellowish (Jan.–Mar. or until Aug., depending upon its locality).

This species responds well in cultivation but requires an alkaline and well-drained soil.

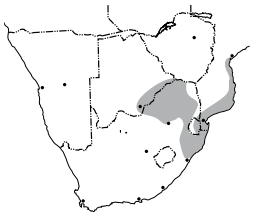
Aloe marlothii A.Berger

Illust. 10

[*A. spectabilis* Reynolds]

S.A. no: 29.5 & 30.6 **Mountain Aloe. Bergaalwyn**

Height: 2–4 m, the single stem bearded with old dry leaves for half its length; widespread and conspicuous, in warm valleys and hill slopes, among rocks and in bush; can form extensive stands. **Leaves:** forming a dense rosette; dull grey-green, edged with reddish brown teeth and with scattered reddish spines over the surface. **Inflorescence:** subsp. *marlothii* with flowerheads branched, 1 per



leaf rosette; the flower spikes, 30–50 cm long, characteristically borne horizontally, with purplish buds and orange flowers, and protruding dark purplish black stamens arranged along the upper side of the spike (Jun.–Aug.); subsp. *orientalis* Glen & D.S.Hardy, formerly known as *A. spectabilis*, has up to 3 flowerheads per leaf rosette, slanted to almost erect; flower stalks dark brown or black, buds orange-red, open flowers golden-yellow, with copious nectar (May–Sept.).

In the Barberton area there is a distinct bicoloured form (pinkish red and cream), and in the Utrecht district flower colour is frequently a deep scarlet. There is very little geographical overlap, but where both forms occur this species can be distinguished from *A. ferox* which has flowerheads that are always at least slightly slanted, shorter spikes, a more dense rosette of leaves, and tips of the inner perianth lobes that are purplish black, not white. In the same area, the leaves of *A. ferox* are almost without spines, while those of *A. marlothii* are distinctly spiny.

The dried leaves are burned and the ash mixed with snuff. A decoction of the leaf is used to treat roundworm, and women sometimes rub the bitter leaf pulp and juice onto their breasts to hasten the weaning of their babies.

These aloes grow well in cultivation and can withstand some frost.

Aloe munchii Christian

Zimb. no: 22 **Large Chimanimani Aloe**

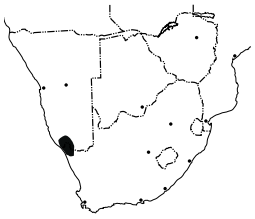
Height: a slender aloe, 2–3 m tall, occasionally reaching 5 m, a few old dry leaves persisting near the leaf rosette but the stem mainly bare; it may be very shortly branched near the apex to form 2 leaf rosettes; strictly confined to the Chimanimani Mountains. **Leaves:** dull greyish green; margin reddish, edged with very small pale teeth. **Inflorescence:** flowerheads branched, sometimes 2 heads per leaf rosette; flowers orange-scarlet (Jul.).

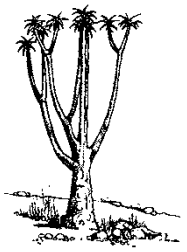
Aloe pillansii L.Guthrie

S.A. no: 30 **Giant Quiver-tree. Reusekokerboom**

Height: up to 10 m, resembling *A. dichotoma* but with fewer, more erect, branches and taller; strictly confined to a very small, intensely hot and arid area in the Richtersveld and just across the Orange River. **Bark:** pale, smooth, tending to flake in shield-like sections. **Leaves:** distinctly clasping the branches, tending to droop downwards, up to 60 cm long and 10 cm at the base. **Inflorescence:** flowerheads branched, but arising from below the leaf rosettes and so hanging downwards (cf. *A. dichotoma*); flowers bright yellow (Oct.).

This aloe does not thrive out of its natural environment.



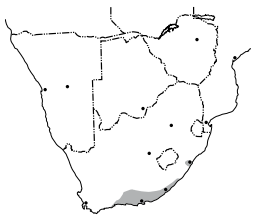


Aloe plicatilis (L.) Mill. Illust. 11
S.A. no: 29.6 **Fan Aloe. Waaieraalwyn**

Height: 3–5 m, with a short, thick stem and numerous branches, the old dry leaves not persisting; occurring on rocky mountain slopes in sandy, well-drained soil. **Bark:** grey to dark grey. **Leaves:** these are unique, being dull grey-green, flat, strap-shaped, small, about 30 × 4 cm, not arranged in a rosette but in an upstanding, flat fan (the specific name, meaning 'pleated', refers to this); margin almost entire, or with minute teeth around the upper third. **Inflorescence:** flowerheads unbranched, simple spikes, short, 15–25 cm long, 1 only per cluster of leaves; flowers uniform scarlet (Aug.–Oct.).

This aloe from a winter-rainfall fynbos area can respond well in cultivation but its natural environment should always be remembered: it requires cool temperatures, high humidity and an acid, well-drained soil.

Aloe pluridens Haw.
S.A. no: 30.1 **French Aloe. Fransaalwyn**

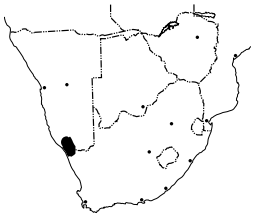


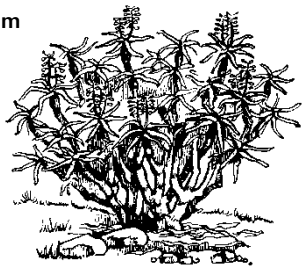
Height: 2–5 m, unmistakably an upright, single-stemmed aloe which may develop a few very short vertical branches near the apex, giving a cluster of leaf rosettes, with the branches and stem bearded with old leaf remains over the upper half only; occurring in thicket vegetation in dry scrub and coastal bush. **Leaves:** spreading outwards and downwards, the lower leaves gracefully drooping, pale green to yellowish green, with a pale marginal line and edged with pinkish white teeth (the specific name refers to its many teeth). **Inflorescence:** flowerheads 4-branched, about 3 per leaf rosette; flowers salmon-pink to strawberry-pink (May–Jul.).

This plant grows successfully in cultivation if the stem is well protected from the hot rays of the sun and from cold winds.

Aloe ramosissima Pillans

S.A. no: 30.2 **Maiden's Quiver-tree. Nooienskokerboom**





Height: 2–3 m, with a very short, squat main stem, often barely 60 cm long, then branching and rebranching to form a spreading, bushy mass, though more sparse and upright specimens do occur (the specific name refers to the very many branches); occurring in areas of extreme heat and drought, on desert mountainsides and in arid ravines and valleys. **Bark:** stem and branches golden-brown and shiny. **Leaves:** small and narrow, 15–20 × 2,2 cm, curved upwards in small rosettes, bluish green, grey-green or yellowish green with a brown tinge, with a yellowish marginal line armed with very small brownish teeth. **Inflorescence:** flowerheads 1 per leaf rosette, branched, with 2 short spikes, 12–15 cm long; flowers yellow, very similar to those of *A. dichotoma* (Jun.–Aug.).

This species does not adapt well to cultivation outside its own desert environment.

Aloe rupestris Baker

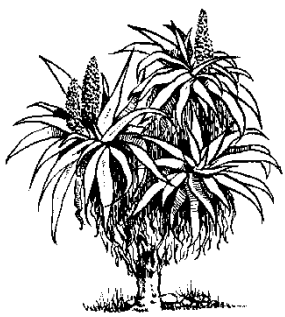
S.A. no: 30.3 **Bottlebrush Aloe. Borselaalwyn**

Height: 3–6 m, occasionally 7 m, the single stem bearded with old dry leaves over the upper third only; a plant of hot hill slopes and valleys, often in groups among trees (the specific name means 'of the rocks'). **Leaves:** curving upwards then outwards in dense rosettes, dull green with a thin reddish marginal line bearing stout reddish teeth. **Inflorescence:** flowerheads branched and rebranched to produce up to 18 spikes, about 20–25 cm long, producing a tricoloured effect; buds orange-yellow tipped with green; young open flowers lemon-yellow with protruding red stamens, older and lower flowers brownish orange (Aug./Sept.).

This aloe responds quite well to cultivation if given an alkaline soil and a warm, sunny, sheltered situation. In addition, the bare lower part of the stem should be well protected from both heat and cold.

Aloe speciosa Baker

S.A. no: 30.5 **Tilt-head Aloe. Slaphoringaalwyn**

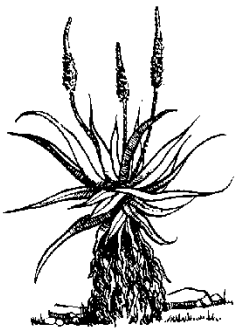


Height: typically an upright, single-stemmed aloe, 3–6 m, or with branches; leaf rosettes often tilted to 1 side; the branches and stem bearded with old dry leaves over the upper three-quarters of the length; occurring usually in large numbers, in hot dry areas, on rocky outcrops, hillsides and in valleys. **Leaves:** long and slender, 60–70 × 7–9 cm, curving, forming a dense spiralled rosette, dull bluish green, often tinged with red, with a very fine, pale red marginal line bearing small, pale red teeth. **Inflorescence:** flowerheads unbranched, spikes short and thickset, about 30 × 12 cm; up to 4 spikes per leaf rosette; buds red, open flowers greenish white, with protruding brownish orange stamens, producing a tricoloured effect (the specific name, meaning 'showy', refers to this) (Jul.–Sept.).

This aloe is frost-tender but responds well in cultivation if given a warm situation.

Aloe spicata L.f.

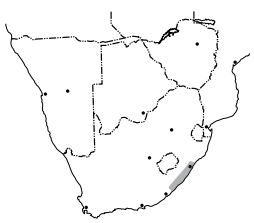
[*A. sessiliflora* Pole-Evans]
S.A. no: 30.4 **Lebombo Aloe. Lebombo-aalwyn**
Zimb. no: 23 **Gazaland Aloe**



Height: 1–1,5 m, to a maximum height of 2 m; either upright and single-stemmed when the stems are fully bearded (this form occurs mainly in the Limpopo Province), or developing numerous branches, in which case it forms a low, sprawling mass barely more than 1 m in height (this form occurs mainly in Swaziland and northern KwaZulu-Natal); occurring on rocky outcrops and hillsides and in bush. **Leaves:** forming dense rosettes, green to reddish with a reddish marginal line, bearing small reddish teeth; in exposed dry areas the leaves becoming conspicuously red. **Inflorescence:** flowerheads unbranched, simple spikes, 30–40 cm long, up to 5 per leaf rosette; flowers stalkless, cup-shaped rather than tubular, yellow with long, protruding stamens (Jul./Aug.).

Aloe thraskii Baker

S.A. no: 30.7 **Strand Aloe. Strandaalwyn**



Height: 1–2 m, occasionally reaching 4 m, the single stem heavily bearded with old dry leaves; occurring in a narrow coastal belt seldom more than a few hundred metres from the sea, in dense coastal bush. **Leaves:** deeply U-shaped, curving over and downward to give a generally drooping effect to the large rosette, dull green to grey-green, with a thin reddish marginal line bearing small reddish teeth; the lower leaf surface may be dotted with scattered spines. **Inflorescence:** flowerheads up to 4 per leaf rosette, branched with 15–25 spikes, short and squat, about 25 × 12 cm; buds greenish orange, open flowers lemon-yellow to pale orange and green-tipped, with stamens protruding and bright orange (late May–early Jul.).

This species does not thrive away from the sea air and spray, but near the coast it does well if cultivated in a situation where the stem is shaded.

DRACAENACEAE (The dragon-tree family)

DRACAENA Vand. ex L.

Trees or shrubs, stems simple or branched. **Leaves:** spirally arranged, leathery and rigid, or soft and sub-fleshy, strap-shaped. **Flowers:** in racemes or panicles; perianth 6-lobed, divided halfway down or almost to the base; bisexual, stamens inserted high up on perianth segments; ovary ovoid, sessile; sweetly scented, opening in the evening; moth-pollinated. **Fruit:** a globose berry.

Key to the tree species of **Dracaena**:

1. **a.** Leaves larger than 30 × 2 cm **2**
   b. Leaves 16–25 × 1–2 cm ..... **D. mannii**
2. **a.** Occurring in the Eastern Cape, Limpopo Province and KwaZulu-Natal **3**
   b. Occurring in the mountains of eastern Zimbabwe and adjacent areas in Mozambique; a sparsely branched tree ..... **D. steudneri**
3. **a.** Usually occurring near water, growing in the shade; mostly leaves longer than 60 cm, with midrib not prominent, in rosettes, spreading to half-drooping; flowers greenish white, 3–4 cm long ..... **D. aletriformis**
   b. Usually occurring on hot, dry, exposed slopes; leaves greyish green, seldom longer than 50 cm, with a prominent midrib, in rosettes, standing upright; flowers greenish white to cream, 2–2,5 cm long ..... **D. transvaalensis**

Dracaena aletriformis (Haw.) Bos

[*D. hookeriana* K.Koch]

S.A. no: 30.9 **Large-leaved Dragon-tree. Grootblaardrakebo**

Height: up to 5 m, a softly woody shrub or a dichotomously branched small tree; occurring over a wide range of habitats in shady places, from dune forest undergrowth to mountain forests, frequently forming dense stands. **Bark:** pale grey, smooth but marked by leaf scars. **Leaves:** large, leathery, strap-like, 60–100 × 7–12 cm, dark green, shiny, fleshy to almost succulent, with a white cartilaginous margin, spreading to half-drooping, in rosettes at the ends of the branches. **Flowers:** white to yellowish green, sweetly scented, in large, loose, erect panicles, up to 1 m long, terminal or axillary with 2 heads per branch; petals up to 2 cm long, slender; opening at night (Nov.–Feb.). **Fruit:** 2-lobed, up to 2 cm in diameter, with thick stalks, turning orange-red when mature (Feb.–Apr.).

When cultivated, these plants should be grown in the shade.

Dracaena mannii Baker

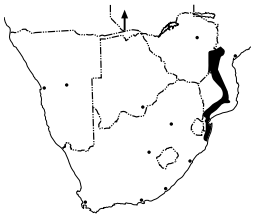
Illust. 12

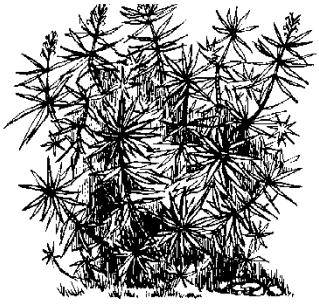
[*D. usambarensis* Engl.; *D. reflexa* Lam. var. *nitens* (Welw. ex Baker) Baker]

S.A. no: 30.8 **Small-leaved Dragon-tree. Kleinblaardrakeboom**

Zimb. no: 29 **Small-leaved Dragon-tree**

Height: usually 3–5 m, but can reach 12 m, a much-branched small tree; occurring on the edges of and in moist evergreen forest, swamp forest and dune forest, usually as single plants. **Bark:** whitish, smooth, inclined to develop a papery peel; branches marked with leaf scars. **Leaves:** narrow, 16–40 × 1–2 cm, dark green, shiny, tending to be in rosettes at the ends of branches on slow-growing shoots, scattered along vigorous shoots, clasping the stem for half its circumference. **Flowers:**



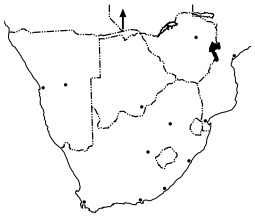


cream, attractive, in loose spikes or branched panicles, terminal, up to 50 cm long; closing during the day and opening at night when they give off a sweet scent (Aug.–Oct.). **Fruit:** fleshy, about 2–2,5 cm in diameter, bright red and conspicuous when mature (Oct.–Dec.).

These plants are frost sensitive.

Dracaena steudneri Engl.

Zimb. no: 30 **Northern Large-leaved Dragon-tree**

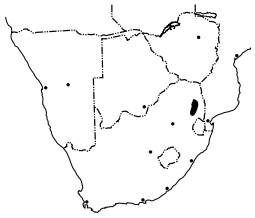


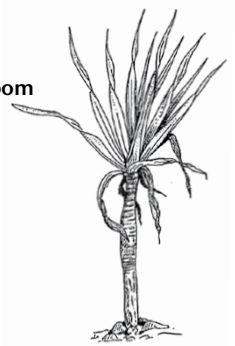
Height: up to 12 m, frequently a single-stemmed, rather palm-like tree which may develop a few branches; occurring at the margin of and in evergreen forest. **Bark:** pale grey-brown, smooth but marked with leaf scars. **Leaves:** large, up to 80 × 10 cm, shiny green, in rosettes at the ends of the branches. **Flowers:** dull white to yellowish green, in large terminal sprays or heads, up to 1 m long; opening at night only, sweet smelling (Aug.). **Fruit:** spherical, about 1 cm in diameter, green turning red and finally black; in large, yellow, branched terminal heads (Oct.–Dec.).

These handsome plants are widely cultivated, in Zimbabwe at least, and are useful landscaping subjects. They root easily from cuttings.

Dracaena transvaalensis Baker

S.A. no: 30.10 **Wolkberg Dragon-tree. Wolkberg-drakeboom**





Height: small tree up to 4 m; occurring in deciduous woodland on hot, dry slopes. **Bark:** grey with prominent leaf scars. **Leaves:** large, leathery, strap-like, 30–50 × 3–5 cm, greyish green, fleshy to almost succulent, with a prominent midrib, stiff, spreading to upright, in rosettes at the ends of the branches. **Flowers:** greenish white to cream, under 2 cm long, slender, in loose, terminal panicles 15–20 cm long; sweetly smelling; opening at night (Jan.–Mar.). **Fruit:** usually 2-lobed, turning orange when mature (Mar.–Jun.).

*AGAVACEAE (The agave and sisal family)

*AGAVE L.

***Agave americana** L. (American Agave, Garingboom)
***Agave sisalana** Perrine (Sisal).
These species have been introduced from central America and have become naturalised and invasive along watercourses, drainage lines and erosion channels in some areas.

MUSACEAE (The banana family)

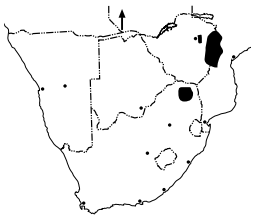
The vegetative appearance of members of the genus *Ensete* is very similar to that of the species of *Strelitzia* which fall in the next family. These plants can easily be confused in the field and the following key is given as a guide, although it cuts across two families:

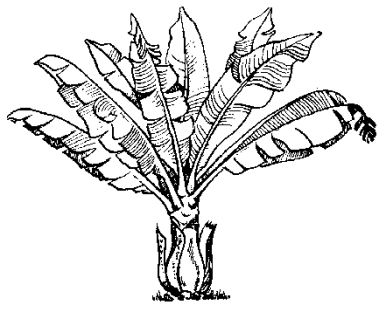
1. **a.** Leaves with petiole short or almost absent, midrib pink; flowers in massive, pendulous racemes, the flowers protected by large, saucer-shaped, maroon bracts; the fruits resembling 'hands' of small bananas ..... **Ensete**
   b. Leaves with petiole up to 2 m long, midrib pale yellowish green; flowers single or in a group, all with the well-known 'crane-flower' shape; fruit a small, woody capsule ..... **Strelitzia**

ENSETE Horan.

Ensete ventricosum (Welw.) Cheesman

[*E. edule* (J.F.Gmel.) Horan.; *Musa davyae* Stapf]
S.A. no: 31 **Wild Banana. Wildepiesang**
Zimb. no: 33 **Wild Banana**





Height: a large, fleshy tree 6–12 m, with a head of banana-like leaves; occurring in patches of high-rainfall forest, in forested ravines and along streams. **Stem:** made up of old leaf bases. **Leaves:** large, banana-like, spirally arranged, fresh green, 2–5 × 1 m, midrib rose-pink, petiole almost absent, the leaf base running on to the stem. **Flowers:** in massive, pendulous spikes, 2–3 m long; single petal, 5 stamens, 3-chambered ovary, the flowers protected by large, maroon-coloured, spathe-like bracts (Oct./Nov.). **Fruit:** indehiscent and leathery, resembling a 'hand' of small bananas, but instead of the soft, delectable flesh, there is a packed mass of hard seeds, like dried peas in size and appearance (Dec.–Mar.).

These plants produce flowers and fruits after about eight years and then die. Despite their disappointing fruit, the trees are used as a staple food-crop in some mountainous areas of the south and southeast of Ethiopia; a meal is prepared from the pulp in the stems and rootstock, and the residue is made into a fibre used for cordage and sacking.

STRELITZIACEAE (The strelitzia family)

STRELITZIA Aiton

Fleshy, banana-like plants, low-growing or tree-like. **Leaves:** arranged in 2 vertical ranks, large, oblong, characteristically becoming torn by the wind; petiole channelled, up to 2 m long. **Flowers:** large and conspicuous, 1 or several in the axil of a leathery bract, the flower arising from a maroon-coloured, boat-shaped spathe; there are 6 perianth parts, the 3 sepals cream or white (or orange in the small species) and upstanding like the crest of a bird; of the 3 petals, the lower 2 touch to form a unique arrowhead-shaped structure, almost beak-like, usually blue but it may be white, with a channel down the centre in which lie the 5 long, very thin stamens and the hair-like style; the third petal is a small frilled structure, scarcely contributing towards the striking appearance of the whole flower. **Fruit:** 3-lobed, woody capsules. **Seeds:** with an orange, woolly aril.

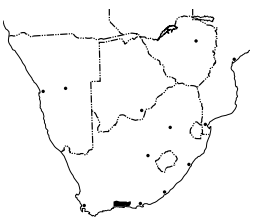
The small species, about 0,5–0,7 m high and with bright orange sepals, is *Strelitzia reginae* Banks, the 'crane flower'. The three tree species are vegetatively very similar and difficult to separate; the differences lie in the flowers and in the geographical distribution of the plants.

Key to the tree species of **Strelitzia**:

1. **a.** Flowerheads simple; several flowers arising from a single spathe **2**
   b. Flowerheads compound; several flowers in the spathe, then a second complete spathe and flowers arising out of the first, a third arising out of the second, and even a fourth and a fifth, each arising out of the preceding one, producing a 'multi-storey' structure; petals blue (very rarely white), with deeply sagittate lobes; coastal from Eastern Cape through KwaZulu-Natal into Mozambique ..... **S. nicolai**
2. **a.** Petals blue with distinct sagittate lobes; occurring in inland montane forests ..... **S. caudata**
   b. Petals white, with rounded, not sagittate lobes; confined to a small area between George and Humansdorp ..... **S. alba**

Strelitzia alba (L.f.) Skeels

S.A. no: 32 **Cape Strelitzia. Kaapse Wildepiesang**



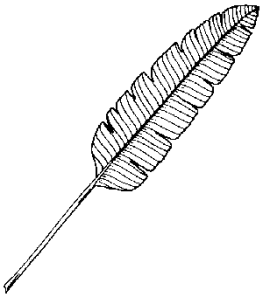
Height: up to 10 m; occurring in evergreen forest. **Leaves:** large, up to 2 × 0,6 m, usually split into ribbons by the wind. **Flowers:** all the petals and sepals white, lacking the blue present in the other species; may be found on the tree at almost any time of year, but mainly Jul.–Dec. **Fruit:** 3-lobed woody capsule (Oct.–Feb., but may be found at almost any time of year). **Seeds:** with a yellowish woolly aril.

Strelitzia caudata R.A.Dyer

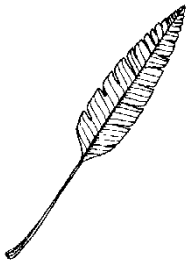
S.A. no: 33 **Mountain Strelitzia. Bergwildepiesang**

Zimb. no: 34 **Mountain Strelitzia**

Occurring in montane forests, usually between rocks on steep slopes. Very similar in size and general appearance to *S. alba*, but the petals are blue to mauve (not white as in *S. alba*), and the group of flowers is in a single spathe, not a tiered structure as in *S. nicolai*. **Fruit:** 3-lobed, dehiscent, woody capsule (may be found at almost any time of the year). **Seeds:** black with an orange, woolly aril resembling a tuft of hair.



Strelitzia nicolai Regel & Körn. Illust. 13
S.A. no: 34 **Coastal Strelitzia. Kuswildepiesang**



Occurring in coastal dune and forest vegetation and adjacent inland forests; very similar in general appearance to the preceding species, the difference lying in the extraordinary multiple structure of the inflorescences which have 1 spathe after another arising out of the preceding one, up to a total of about 5, each spathe with its group of flowers at right angles to those below and above it so that a column with 5 layers of flowers results. A slimy mucilage produced within the spathe assists the very tightly packed flowers to emerge (throughout the year, with a peak in summer). **Fruit:** a 3-lobed woody dehiscent capsule, 5–7 cm long. **Seeds:** black with a bright orange woolly aril, looking like a small black face with a brilliant orange furry cap above it.

MAGNOLIOPSIDA (Dicotyledons)

CASUARINACEAE (The beefwood family)

*CASUARINA L.

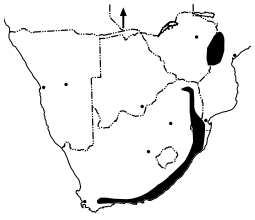
***Casuarina cunninghamiana** Miq. (Beefwood, Kasuarisboom)
***Casuarina equisetifolia** L. (Horsetail Tree, Perdestertboom)
The casuarinas were introduced into southern Africa from Australia and the Far East. They have been planted widely in Africa and have been used for dune stabilisation. In certain areas they have escaped and have now become naturalised but are not yet considered a pest plant.

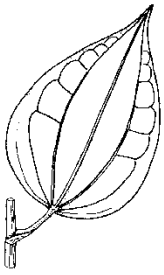
PIPERACEAE (The pepper family)

PIPER L.

Piper capense L.f.

S.A. no: 34.5 **Wild Pepper. Wildepeper**
Zimb. no: 35 **Wild Pepper**





A soft-wooded, straggling shrub, or occasionally a small tree up to 4 m in height, which can develop a well-rounded crown; occurring in moist, shady places, in forests and along streams. **Bark:** light brown and corky; stem and branches with conspicuously thickened nodes giving them a jointed appearance. **Leaves:** simple, spirally arranged, often with a leaf-opposed short lateral shoot that sometimes gives a false impression of an opposite leaf; ovate, 5–15,5 × 2,5–15 cm, thinly textured, dark green and glossy above, paler green or greyish or bluish green below, veining conspicuous with 3–11 veins from the base, the 3 middle veins reaching the apex, indented above to give a quilted appearance, prominent below; apex tapering and frequently attenuate; base shallowly lobed, sometimes somewhat asymmetric; margin pure entire; petiole 2–4 cm long; stipules leaf-like, 1–1,5 cm long, joined to the petiole, falling early. **Flowers:** minute, pure white, in dense, cylindrical spikes up to 8 cm long, at the end of short lateral branches; bisexual and male flowers together on the same spike or on different spikes; calyx and petals absent; stamens 2 or 3, giving the spike its white appearance; ovary ovoid, stigmas 2, recurved (Aug.–Feb.). **Fruit:** a small berry, broadly ovoid to almost round, 2–4 mm in diameter, densely clustered along the axis to form a spike up to 10 cm long, green at first turning black (Oct.–Jun.).

This is a large genus widely distributed throughout the warm regions of the world. Some of the species are of economic importance: both black and white pepper are obtained from *Piper nigrum* L., a native of the Far East, and cultivated in East Africa and Zimbabwe; betel pepper from *Piper betle* L., while *Piper cubebe* L.f. provides cubebs. In the past pepper was obtained from *P. capense* but this is probably no longer the case; the berries have a spicy taste and smell, and Synnerton recorded that they imparted a good flavour to soups and stews.

SALICACEAE (The willow family)

*POPULUS L.

***Populus alba** L. (White Poplar, Witpopulier)
***Populus** x **canescens** (Aiton) Sm. (Grey Poplar, Vaalpopulier)
***Populus deltoides** Bartram ex Marshall (Match Poplar)
***Populus niger** L. var. **italica** (Lombardy Poplar)
These species originally from Europe, Asia and North America, were all introduced into southern Africa and have now escaped and become naturalised locally, invading dongas, vleis and river valleys. They are the most common alien invasive trees in Lesotho. Introduced to stabilise gullies, they have spread along crevices into surrounding rocky outcrops.

SALIX L.

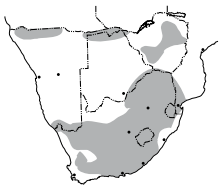
Marie Jordaan has recently revised the genus. The author is grateful to her for permission to include information from her draft manuscript.

Trees or shrubs. **Leaves:** simple, spirally arranged, often small and narrow, margin entire or toothed; the indigenous species without stipules. **Flowers:** in spikes, or catkins; sexes separate on different trees; perianth parts (sepals and petals) absent; male flowers with 2 or 3 to many stamens; female flowers with an ovary with or without a stalk, style often very short; ovules 4–8. **Fruit:** a bivalved capsule. **Seeds:** woolly.

The tough, elastic wood of *Salix alba* L. is used for cricket bats and Dutch clogs.

***Salix babylonica** L. (Weeping Willow. Treurwilger)
***Salix fragilis** L. (Crack or Brittle Willow)
Introduced from Europe but the Weeping Willow originally from Asia were planted extensively in southern Africa along rivers and around dams. They have now escaped and become naturalised, spreading vegetatively from detached branches and invading watercourses. In Lesotho, at higher altitudes, they are not only confined to watercourses.

Salix mucronata Thunb.



A bush or tree up to 12 m, frequently distorted, becoming almost prostrate by the force of flood waters; in larger specimens the branches inclined to droop; always occurring along stream and river banks and on islands, in a wide range of habitats. **Bark:** rough, brown, deeply vertically fissured and scaling in narrow flakes; branchlets often reddish. **Leaves:** lanceolate, 2,5–12 × 0,6–2 cm, with or without fine hairs, dark to clear green above, paler to almost silvery grey below; tapering to base and apex; margin finely serrated or entire; petiole short, reddish. **Flowers:** small; male flowers in spikes coloured yellowish by the stamens, dense, about 1,5–2 × 0,5 cm; female flowers greenish, urn-shaped, in spikes about 2 × 1 cm, more open than those of the male (Aug./Sept., but may have a second flowering season Mar./Apr.). **Fruit:** a small capsule, splitting to release the tufted, woolly seeds which are wind-distributed but do not remain viable for long (Jan.–Apr., and again in Jun./Jul.).

This species is widespread throughout Africa and for a long time has been widely known as *S.subserrata*, the name given it by Willdenow in 1806. However, Thunberg had already named the species *S. mucronata* in 1794. Accepting that the two are the same species, *S. mucronata* is the older name and so takes precedence. In southern Africa the species has been split into four subspecies.

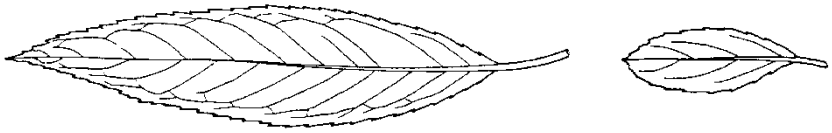
The leaves that appear with the flowers in spring differ from those found on the trees in summer.

Key to the subspecies of **S. mucronata**:

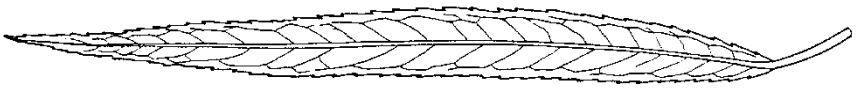
1. a. Branches and leaves mostly hairless, may be grey; not occurring along the Olifants and Berg rivers and their tributaries in the Western Cape **2**

b. Branches and leaves covered with dense, silvery, silky hairs, especially when young; occurring only along the Olifants and Berg rivers and their tributaries in the Western Cape.
Subsp. **hirsuta** (Thunb.) Immelman
[*S. hirsuta* Thunb.]
S.A. no: 35.1 **Silver Willow. Silwerwilger**

2. **a.** Leaves less than 1,5 cm wide, usually more than 5 times as long as wide **3**
   b. Leaves 1,2–3 cm wide and only about 3–5 (can be up to 7) times as long as wide; occurs in Namibia and Botswana along the Zambezi–Cunene river systems and throughout Zimbabwe.
   Subsp. **subserrata** (Willd.) R.H.Archer & Jordaan Illust. 14
   [*S. subserrata* Willd.; *S. safsaf* Trautv.]
   S.A. no: 36 **Safsaf Willow. Safsafwilger**
   Zimb. no: 39 **Wild Willow**



3. **a.** Summer leaves usually longer than 6 cm; petioles 4–14 mm; twigs and leaves greyish and densely to slightly velvety to hairless; occurring along the rivers that run into the Indian Ocean from the Komati and Maputo rivers in the north to the Umzimkulu in the south.
   Subsp. **woodii** (Seemen) Immelman
   [*S. woodii* Seemen; *S. mucronata* Thunb. subsp. *wilmsii* (Seemen) Immelman; *S. wilmsii* Seemen]
   S.A. no: 36.1 **Flute Willow. Fluitjiewilger**



   b. Summer leaves usually shorter than 6,5 cm; petioles 2–5 mm; twigs usually hairless; occurring mainly along the Orange and Vaal rivers and their tributaries and along the rivers of the Western Cape and Eastern Cape as far north as Port Shepstone.
   Subsp. **mucronata** (Thunb.) Immelman
   [*S. capensis* Thunb.; *S. gariepina* Burch; *S. mucronata* Thunb. subsp. *capensis* (Thunb.) Immelman]
   S.A. no: 35 **Small-leaved Willow. Kleinblaarwilger**

In years past a group of these trees was believed to indicate that the ground was hard and that the river at that point could be forded safely either on horseback or with a wagon. The wood is light and soft and, in areas where willows are almost the only trees, has been put to a wide range of uses. Farmers used to travel many miles to collect logs for their rafters, and from the wood local African people make bowls and mortars for grinding their maize. The leaves, although rather bitter, are a valuable fodder and an excellent fowl food, and they are widely used as a natural remedy for fevers and rheumatism. Twigs from the willow are believed to have the power to ward off storms, but to be effective they must first be coated with a special mixture which has the fat of a black goat as one of its main ingredients. Then one stick is thrust into the roof to protect the home from lightning, and another is pointed towards the threatening thunder-clouds, presumably in the hope that they will change direction. These sticks are also used to kindle fire by friction in the time-honoured manner.

The trees are easily propagated from cuttings or truncheons.

MYRICACEAE (The waxberry family)

MORELLA Lour.

Shrubs or trees, often aromatic. Leaves: simple, spirally arranged, margin entire or variously indented. **Inflorescence:** a spike. **Flowers:** sexes separate, on different trees or on the same tree; perianth (sepals and petals) absent; male flowers with 2 to many stamens (often 4–6), short filaments and a vestigial ovary; female flowers with vestigial stamens, ovary without a stalk, 2 stigmas. **Fruit:** a small drupe, round or ovoid, often waxy.

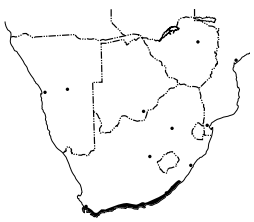
Key to the tree species of **Morella**:

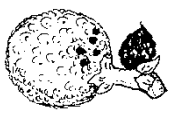
1. **a.** Base of leaves narrowly tapering to rounded **2**
   b. Leaves almost heart-shaped with a lobed base, tightly clasping the stem; locally common on sandy flats and dunes, forming dense patches from Langebaan to the Kei River mouth ..... **M. cordifolia**
2. **a.** Leaf bases narrowly tapering **3**
   b. Leaf bases broadly tapering to rounded; leaves 3–7 cm long, seldom with conspicuous gland dots; branchlets often with lenticels ..... **M. pilulifera**
3. **a.** Leaves larger, not conspicuously narrow, usually more than 5 × 1 cm; riverine **4**
   b. Leaves small and conspicuously narrow, usually about 3 cm long and less than 0,7 cm wide ..... **M. microbracteata**
4. **a.** Leaves without conspicuous net-veining, usually conspicuously gland-dotted below ..... **M. serrata**
   b. Leaves usually with conspicuous net-veining, but not conspicuously gland-dotted; confined to an area between Clanwilliam and Stellenbosch ..... **M. integra**

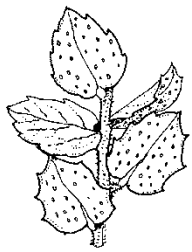
Morella cordifolia (L.) Killick

[*Myrica cordifolia* L.]

S.A. no: **Dune Waxberry. Duinewasbessie**







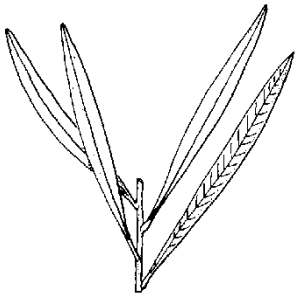
Usually a prostrate shrub but can reach 3 m; locally common on stabilised dunes and forming dense patches. **Bark:** grey to blackish. **Leaves:** closely packed, clasping the stem, ovate to almost round, 0,6–2,1 × 0,4–1,5 cm, leathery, with conspicuous gland dots particularly below; apex tapering to rounded; base lobed; margin unevenly toothed; petioles absent. **Flowers:** small, in short, axillary spikes; sexes separate and on different trees; male spikes 2–5 mm long; female spikes 1 cm long, greenish (Apr.–Jul.). **Fruit:** small, 5–8 mm in diameter, spherical, warty, bluish, densely covered with dense waxy scales (can be found most of the year).

The fruits are sometimes melted down and the wax used for polish or for making candles. This is the 'true' waxberry from which the genus derives its common name.

Morella integra (A.Chev.) Killick

[*Myrica conifera* Burm.f. var. *integra* A.Chev.; *M. integra* (A.Chev.) Killick]

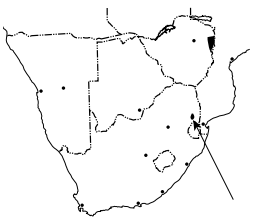
S.A. no: 38.1 **Western Waxberry. Westelike Wasbessie**

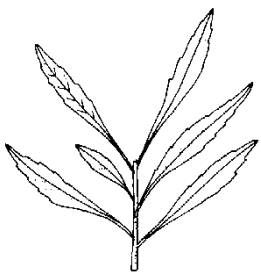


A shrub or small tree up to 3 m; often occurring in hilly or mountainous places, usually along the rocky banks of streams or rivers and confined to 1 small area only. **Bark:** grey to blackish. **Leaves:** slender, lanceolate 2,5–7,5 × 0,3–1,3 cm, leathery, with conspicuous net-veining; tapering to apex; narrowly tapering to base; margin entire, occasionally finely toothed; petiole very short. **Flowers:** small, in short, axillary spikes; sexes separate and on different trees (usually Mar./Apr., although some plants may flower in Sept.). **Fruit:** very small, about 3 mm in diameter, spherical, warty with a layer of white wax over the surface (Oct.).

Morella microbracteata (Weim.) Verdc. & Polhill

[*Myrica microbracteata* Weim.]
S.A. no: **Mountain Waxberry. Bergwasbessie**
Zimb. no: 40 **Nyanga Waxberry**

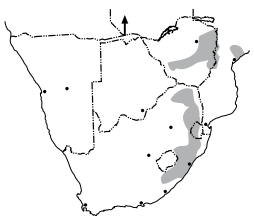


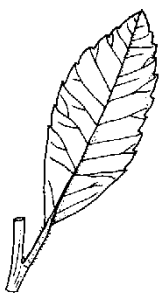


Usually a shrub, but may become a small tree reaching 3,5 m in height; occurring in mountainous areas, among rocks and along stream banks. **Bark:** dark grey. **Leaves:** small, conspicuously narrow, linear to narrowly lanceolate, frequently only 2,5 × 0,3 cm, but occasionally reaching 4 × 0,7 cm; narrowly tapering to base and apex; margin conspicuously, often deeply, toothed; petiole short. **Flowers:** in short, dense axillary spikes; sexes separate but on the same tree; male spikes about 10 × 3 mm, reddish with yellow anthers; female spikes 1–3 cm long, greenish (Jul.–Oct.). **Fruit:** small, berry-like, about 3 mm in diameter (Oct.–Dec.).

Morella pilulifera (Rendle) Killick

[*Myrica pilulifera* Rendle]
S.A. no: 37 **Broad-leaved Waxberry. Breëblaarwasbessie**
Zimb. no: 41 **Broad-leaved Waxberry**



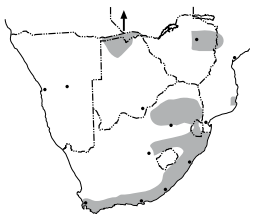


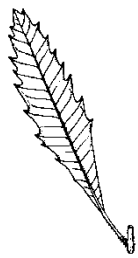
Usually a small tree 3–4 m high, but specimens growing under very favourable conditions can reach 10–12 m; occurring in mountainous places, among rocks, along streams, on grassy slopes and fringing forests. **Bark:** dark grey-brown to almost black, thin and rather smooth; branchlets often with lenticel. **Leaves:** elliptic to oval or obovate, up to 11 × 4 cm, but usually much smaller, about 7 × 2,8 cm, yellowish green, young leaves velvety or hairy, losing many of these hairs later, leathery, lateral veins ridged above, sometimes forming a Y just before margin; apex and base broadly tapering to almost rounded; margin variable, from almost entire to jaggedly toothed; petiole up to 1 cm long, pinkish on new growth, hairy. **Flowers:** sexes separate, on the same tree or on separate trees; flowers in short spikes; male spikes rusty-red; female spikes yellowish green and usually longer than the male spikes (Jul.–Sept.). **Fruit:** small, almost spherical, dark brown to black, with a waxy outer layer (Oct./Nov.).

The young leaves are maroonish, the colour persisting for some time on the midrib and petiole.

Morella serrata (Lam.) Killick Illust. 15

[*Myrica serrata* Lam.; *M. conifera* sensu Hutch. non Burm.f.; *M. natalensis* C.DC.]
S.A. no: 38 **Lance-leaved Waxberry. Smalblaarwasbessie**
Zimb. no: 42 **Lance-leaved Waxberry**





Sometimes a shrub, but usually a small tree 3–4 m high, although under favourable conditions it can reach 10 m; locally common along stream banks. **Bark:** grey to brownish and rough, but pale grey and smoothish when young. **Leaves:** narrowly elliptic, usually about 10 × 2 cm, but sometimes up to 15 × 2,5 cm, young leaves markedly yellow, mature leaves yellowish green, conspicuously golden gland-dotted below, aromatic; apex tapering; base running down the petiole; margin more or less conspicuously toothed, the teeth curving backwards, to entire; petiole short. **Flowers:** small, in short spikes; male spike short and squat, rusty red, with whitish yellow anthers; female spike longer, more slender and green (Aug./Sept.). **Fruit:** small, spherical, 2–3 mm in diameter, warty, bluish black, with a white waxy coating (Oct.).

The fruits of this tree, and also its stems and leaves, produce oils: the oil from the fruits is pure and greenish yellow, while that of the stems and leaves has an aromatic smell fleetingly reminiscent of eucalyptus. Traditionally, branches used to be immersed in boiling water and a substance known as 'berry wax' skimmed off as it rose to the surface. In fact, this was not a wax at all but a true fat rich in fatty acids, only 9% of which were saturated. The fruits are sometimes eaten, but when the leaves are chewed an intense burning at the back of the throat and nose and a severe headache result – unpleasant conditions which persist for several hours.

CELTIDACEAE (The white-stinkwood family)

Key to the tree genera:

1. **a.** Branches without spines; stipules not joined over leaf buds; leaves with a midrib and a distinct pair of lateral veins starting at the base, apex without a bristle tip **2**
   b. Branches spinescent; stipules large, ensheathing the leaf buds; leaves with a marked bristle tip ..... **3. Chaetacme**

2. a. Leaves with the margin completely and finely toothed; flowers very shortly stalked, almost sessile, in short, dense, axillary cymes, or clusters; fruit black ..... **2. Trema**
b. Leaves with margin entire or lower half or one third of margin entire, the coarse teeth confined to the upper half or two thirds; flowers with distinct stalks, or pedicels, up to 1,8 cm long, in small clusters or solitary ..... **1. Celtis**

1. CELTIS L.

Shrubs or trees. **Leaves:** simple, alternate; stipules falling early. **Flowers:** on stalks up to 1,8 cm long, solitary or in small, axillary clusters; bisexual, or sexes separate on the same tree; floral parts in 4s or 5s, the stamens opposite the perianth segments; ovary sub-globose, stigmas sessile, stout and spreading. **Fruit:** a drupe.

Key to the tree species of **Celtis** (alien species marked with an * included at the end of the key):

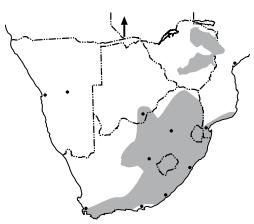
1. a. Leaf apex may be attenuate but not extremely long and slender; leaf base asymmetric **2**
b. Leaf apex very long and slender, drawn out into a conspicuous drip-tip which accounts for almost one third of the total length of the leaf; margins usually entire, but a few obscure teeth may be present around the upper half (notably in coppice leaves and shade leaves); not very conspicuously 3-veined from the base, which is only slightly asymmetric; fruit top-shaped, about 10 mm long ..... **C. gomphophylla**

2. a. Leaf margin finely and regularly toothed around the upper half; leaves up to 10 × 5 cm, conspicuously 3-veined from the base, with the veins extending into the upper half of the blade; fruit small, almost spherical, about 6 mm in diameter; widespread in a variety of habitats ... . **C. africana**
b. Leaf margin with coarse, rounded, irregular teeth around the upper half; leaves up to 17 × 7 cm, lateral veins from the base hardly reaching halfway along the blade; fruit urn-shaped, about 1,2 cm long; uncommon in low- to medium-altitude forests ..... **C. mildbraedii**

***Celtis australis** L.
***Celtis sinensis** Pers.
These species have been introduced as garden subjects and are hybridising with *C. africana*, particularly in Gauteng where the hybrids are germinating freely.

Celtis africana Burm.f. Illust. 16

[*C. kraussiana* Bernh.]
S.A. no: 39 **White-stinkwood. Witstinkhout**
Zimb. no: 43 **White-stinkwood**



Occasionally small and shrubby, but usually a fine spreading tree about 12 m high, sometimes reaching a height of 30 m when in forests; away from the coastal belt it is nearly always deciduous, in winter, standing stark and conspicuous with its pale trunk and branches; occurring in a very wide range of habitats, from the coast to 2100 m, from rocky outcrops to evergreen forests, but usually associated with higher-rainfall or moister places. **Bark:** pale grey to almost whitish, smooth. **Leaves:** ovate, 1,5–10 × 1–5 cm, from very sparsely to densely hairy, mature leaves dark green, young leaves pale fresh green, conspicuously 3-veined from the base; apex shortly and abruptly attenuate; base rounded or lobed, asymmetric; margin finely and regularly toothed around the upper half or two

thirds; petiole short. **Flowers:** sexes separate but on the same tree, small, greenish, inconspicuous; male flowers in dense clusters at the base of new green branchlets; female flowers solitary or in small groups of 2 or 3 in the leaf axils (Aug.–Oct.). **Fruit:** small, about 6 mm in diameter, ovoid, yellow or brownish, on slender stalks about 1,3 cm long (Oct.–Dec.).

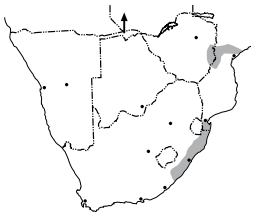
The wood, which is white to yellowish, is of medium hardness but because it is tough and strong it is difficult to work. Nevertheless, since it takes quite a good polish it would be suitable for domestic purposes – and is widely used to fashion a variety of household articles.

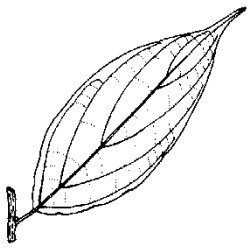
From its unpleasant smell when freshly cut, this tree has been called white-stinkwood – an unfortunate name since it leads to confusion with the true stinkwood, *Ocotea bullata*. In fact, the two are not related in any way, nor has the wood of *C. africana* any commercial value.

This is an excellent tree for large gardens and it is also very suitable in parks and along streets. The seed germinates well when fresh and, if given good soil and plenty of water, the plant can grow 1–2 m per year. It is fairly drought resistant and can withstand a certain amount of frost; some strains appear to be more frost resistant than others.

Celtis gomphophylla Baker

[*C. dioica S.Moore; C. durandii* Engl.]
S.A. no: 40 **Rough-leaved White-stinkwood. Growweblaarwitstinkhout**
Zimb. no: 44 **Rough-leaved White-stinkwood**





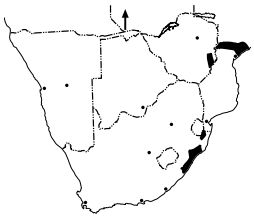
A large tree reaching at least 25 m in height; occurring in evergreen forests. **Bark:** grey, smooth, with the trunk often fluted. **Leaves:** ovate to oblong, 8–19 × 2,5–9 cm, dark green, minutely and stiffly hairy, giving the leaf a roughish feel; apex conspicuously attenuate and forming a long, slender drip-tip which accounts for almost one third of the leaf length; base rounded and broadly tapering, only slightly asymmetric; margin usually entire or with a few obscure teeth around the upper half; petiole short. **Flowers:** very small, greenish, inconspicuous, in small clusters; sexes separate but on the same tree (Jul.–Oct.). **Fruit:** top-shaped, about 10 × 6 mm, yellow (Dec.–Mar.).

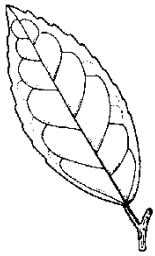
The leaves resemble those of *C. africana*, but are generally larger with the very pronounced drip-tip; the leaf base is less asymmetric and the three veins at the base are somewhat obscure, whereas they are prominent in *C. africana*.

The wood has an unpleasant smell, described by various collectors as 'foetid and persistent' and 'a vile smell'; this is noticeable from the decaying wood of fallen trees in the forest. It is said that pieces of bark are hung in rural homes to guard against snakes, and certainly trees are sometimes found with strips of the bark torn away.

Celtis mildbraedii Engl. Illust. 17

[*C. franksiae* N.E.Br.]
S.A. no: 41 **Red-fruit White-stinkwood. Rooivrugwitstinkhout**
Zimb. no: 45 **Red-fruit White-stinkwood**

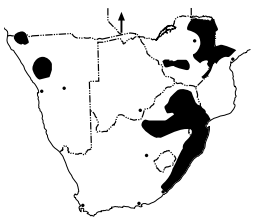




A large tree reaching a height of 30 m; uncommon, in isolated patches of forest; at the southernmost limit of its range in southern Africa. **Bark:** light brown, fairly smooth; the trunk is well buttressed in large specimens and, together with the branches, may bear fairly conspicuous whit-ish lenticels. **Leaves:** oblong, 5–17 × 2–7 cm, stiff, shiny green, obscurely 3-veined from the base; apex shortly and abruptly attenuate; base rounded to broadly tapering, oblique; margin entire in the lower half, with coarse, rounded and irregular teeth around the upper half, inclined to be wavy; petiole short. **Flowers:** small, inconspicuous, greenish, in small axillary clusters; bisexual, or with the sexes separate but on the same tree (Sept./Oct.). **Fruit:** small, urn-shaped, up to 1,2 cm long, red, fleshy, tipped with the shrivelled, rather contorted remains of the stigmas (Oct./Nov.).

2. TREMA Lour.

Trema orientalis (L.) Blume
[*T. guineensis* (Schumach. & Thonn.) Ficalho]
S.A. no: 42 **Pigeonwood. Hophout**
Zimb. no: 46 **Pigeonwood**

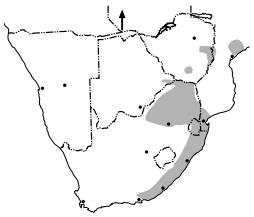


A shrub or medium-sized tree reaching 13 m; occurring in a variety of habitats, usually in moist soils, at forest margins, along watercourses, often a constituent of the riverine fringe thicket, also in ravines and valleys and even along dry, sandy riverbeds; in the drier habitats its size diminishes. **Bark:** smooth, light grey on both the trunk and branches. **Leaves:** ovate, 4–20 × 2,5–5 cm, glossy, bright green above, dull paler green below, rather rough, scabrid to hairy, 3-veined from the base, the veins grooved above, more or less prominent below; apex tapering; base rounded to lobed, more or less symmetric; margin finely and regularly toothed all the way around; petiole short; stipules falling very early. **Flowers:** small, yellowish green, inconspicuous, in dense axillary clusters, or cymes, about 10 mm in diameter; sexes separate but on the same tree; floral parts usually in 5s, ovary almost without a stalk and with a fringe of hairs around the base (mainly Dec.–Feb., usually lasting about 3 months). **Fruit:** small, round, 4–6 mm in diameter, on very short stalks, becoming dark purple and finally black; the first fruits ripen while the last of the flowers are still on the tree (Jan.–Jun.).

This is a common pioneer tree, and among the first to become established on disturbed soils. Seeds germinate readily and growth is rapid so this species is widely planted for the reclamation of soils. The wood is light pinkish and has little commercial value. It has been used for fruit boxes but, when tested for the manufacture of matches, was found to be unsuitable.

3. CHAETACME Planch.

Chaetacme aristata Planch.
[*C. nitida* Planch. & Harv.; *C. serrata* Engl.]
S.A. no: 43 **Thorny-elm. Doringolm**
Zimb. no: 47 **Thorny-elm**



A vigorous shrub with a tendency to scramble, or a tree with a dense canopy reaching 13 m or more, often branching low down; occurring along streams in wooded grassland, in riverine fringe thicket, in wooded ravines and near the coast, often in scrub and forest. **Bark:** pale grey; the bole is often fluted and, together with the branches, may be armed with sharp, tough spines, often paired, that also arise on either side of the leaves, particularly coppice leaves; branchlets zigzagging between the nodes. **Leaves:** elliptic to ovate, up to 9 × 5 cm, dark glossy green above, thick and rather leathery, midrib with a groove along the top; apex broadly tapering to rounded, notched, with a conspicuous hair-like bristle (up to 7 mm long) at the tip; base tapering to rounded or slightly lobed; margins usually entire, occasionally sharply toothed, especially on young growth and coppice leaves; petiole 3–6 mm long, petiole and branchlets velvety; stipules conspicuous, joined to form a sheath over the young leaf bud, but fall early. **Flowers:** small, greenish; sexes separate, but on the same tree; floral parts in 5s; male flowers in small, dense, axillary clusters, or cymes, with pistillodes; female flowers solitary, with the stigmas long and densely hairy, without staminodes (Oct.–Dec.). **Fruit:** a globose drupe, about 1,5 cm in diameter, yellow, tipped with the remains of the long, slender stigmas (Jan.–Sept.).

The wood is heavy, yellowish, and very hard and tough. It is difficult to chop and so the tree frequently survives when others are felled.

MORACEAE (The fig and mulberry family)

see also CECROPIACEAE (p. 153)

During the updating of this family the author had access to information that forms part of the manuscript of The Figs of Southern and South-central Africa by John and Sandie Burrows. Their help and kind permission to use the information is much appreciated and acknowledged with grateful thanks.

All the genera are characterised by the much enlarged and swollen receptacles (bearing the flowers and the fruits). The receptacle may either grow up as a fleshy central column on which the flowers and fruits are produced, as in the mulberry (in these cases, the fruits themselves may become enveloped by the persistent perianth segments which may become fleshy, as in the mulberry), or it may grow out, up and over, so forming a hollow sphere inside which the flowers and fruits are produced, a small pore being left open at the apex, as in the figs. A copious sap, often milky, is also characteristic.

Key to the genera:

1. **a.** Shrubs or trees without spines **6**
   b. Shrubs or small trees with spines ..... **3. Maclura**
2. **a.** Leaves with a single midrib and the first 2 lateral veins do not start as a distinct pair right at the base **3**
   b. Leaves strongly 3-veined from the base, or with a midrib and the first 2 lateral veins starting as a distinct pair at, or near, the base (most obvious below) ..... **6. Ficus**

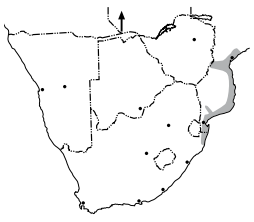
3. a. Leaves with margin entire **4**
b. Leaves with margin serrated, toothed or scalloped **5**
4. a. Leaves spirally arranged with apex tapering to rounded, not really forming a drip-tip; mouth at the apex of receptacle partially closed over by very small bracts; stamens and styles not protruding from the mouth ***6***
b. Leaves distinctly alternate, with apex finally abruptly attenuate, forming a narrow tip about 1,5 cm long; mouth at the apex of the receptacle completely open, bracts absent; stamens and styles protruding from the mouth, the stamens forming a conspicuous white brush-like head, often partly concealing the containing receptacle ..... **5. Trilepisium**
5. a. Leaves hairy or velvety (at least when young) with many lateral veins, 10–22 pairs; petiole 1–5 cm long ..... **2. Milicia**
b. Leaves usually hairless with 4–13 lateral veins, and net-veining distinct; petiole very short, no longer than 0,7 cm ..... **4. Streblus**
6. a. Leaves distinctly alternate; flowers on the outside of an enlarged receptacle ..... **1. Morus**
b. Leaves spirally arranged; flowers on the inside of a hollow, almost closed receptacle, opening only by a small apical pore ..... **6. Ficus**

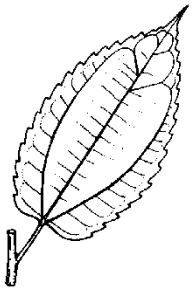
1. MORUS L.

***Morus australis** Poir. [*M. indica* auctt. non. L.; *M. alba* L. sensu Coates Plagrave (1983), Trees of Southern Africa] (Mulberry, Moerbei): introduced from Asia and widely planted in southern Africa, this has escaped and is invading open urban areas, grassland, roadsides and river banks. Proposed a declared invader in South Africa.

Morus mesozygia Stapf

[*M. lactea* (Sim) Mildbr.]
S.A. no: 44 **African Mulberry. Afrika-moerbei**
Zimb. no: **African Mulberry**



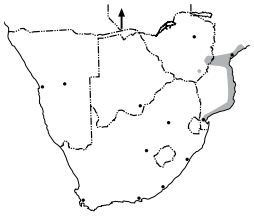


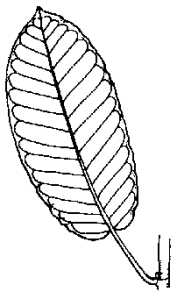
A large tree reaching 20–30 m in height; a common canopy tree in inland evergreen forest, coastal forest and dune forest. **Bark:** light grey to brown, characteristically mottled with paler patches and longitudinally fissured; milky latex present. **Leaves:** simple, alternate, ovate, 7–15 × 4–8 cm, resembling those of the cultivated mulberry but larger, light to darkish green, with sparse rough hairs, conspicuously 3-veined from the base, net-veining distinct below; apex abruptly attenuate, forming a long, slender drip-tip; base rounded, square to lobed; margin roughly toothed; petiolate; stipules falling early. **Flowers:** sexes separate, either on the same tree or on different trees; floral parts in 4s; male flowers in short, creamy white, axillary spikes, the stamens bent double in the bud and straightening suddenly with an audible 'click' as they are released, at the same time throwing out a visible puff of pollen; female flowers several, in compact, axillary heads, with conspicuous long, hair-like styles, perianth completely enveloping the ovary (Oct./Nov.). **Fruit:** a very small nutlet completely surrounded by the persistent, fleshy, reddish to purplish black perianth lobes; resembling the cultivated mulberry, but smaller (Oct.–Dec.).

The field observations by Ian Garland on the pollen ejection from the flowers are acknowledged.

2. MILICIA Sim

Milicia excelsa (Welw.) C.C.Berg
[*Chlorophora excelsa* (Welw.) Benth. & Hook.f.]
Zimb. no: 50 **Mvule**



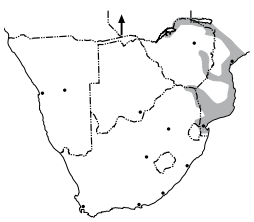


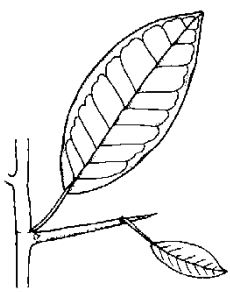
A large tree reaching 50 m in height; occurring in low-altitude evergreen forest. **Bark:** pale whitish grey, roughish and scaly, the bole with irregular buttresses; sap slightly milky. **Leaves:** simple, spirally arranged, large, oblong to broadly ovate, 12–18 × 6,5–9,5 cm, thinly textured, hairless to roughly hairy and rather scabrous, green above, finely velvety and paler below, the old leaves often becoming a bright yellow; apex rounded, finally abruptly and shortly attenuate; base lobed; margin scalloped, wavy; petiole 1–5 cm long; stipules soon falling. **Flowers:** in spikes; sexes separate on separate trees; floral parts in 4s; male spikes long and slender, 8–20 × 0,5 cm, with white flowers, the stamens bent double in the bud and so possibly ejecting pollen as in *Morus mesozygia*, anthers yellow; female spikes short and thickset, 2–3 × 1 cm, with greenish flowers, the perianth lobes enveloping the ovary (Sept./Oct.). **Fruit:** a small nutlet, surrounded by the fleshy perianth lobes, clustered closely together and forming a mulberry-like structure (Oct.–Dec.); dispersed by birds and bats.

The wood is an attractive brown, darkening on exposure and with oiling. Under the name *iroko* or *mvule*, it is in great demand in East Africa as a general purpose timber, especially in building.

3. MACLURA Nutt.

Maclura africana (Bureau) Corner
[*Cardiogyne africana* Bureau]
S.A. no: 44.1 **African Osage-orange. Afrika-soetlemoen**
Zimb. no: 49 **African Osage-orange**





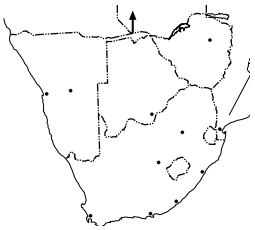
A spiny shrub, often scrambling, or a small tree up to 8 m; occurring in hot, dry, low-lying areas in riverine vegetation, on the edge of pans and in coastal dune scrub. **Bark:** creamy brown; white or yellowish latex present; branchlets spine-tipped. **Leaves:** simple, spirally arranged, elliptic, 3–9 × 1–4 cm, dark green, hairless; apex broadly tapering to rounded, and notched; base broadly tapering to square; margin entire, slightly rolled under; petiolate; stipules persistent. **Flowers:** sexes separate on different trees, axillary, white, sweetly scented, in small, dense, almost spherical heads, about 1,5 cm in diameter; floral parts in 4s; male flowers with the stamens bent double in the bud, so the pollen is probably ejected as in *Morus mesozygia*; female flowers with the perianth completely enveloping the ovary, stigmas up to 1,3 cm long (Mar.–May).

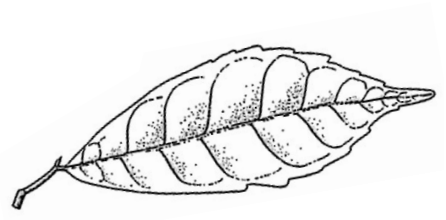
Fruit: a head of small nutlets, each surrounded by the persistent perianth parts, now thick and fleshy and forming a pulp, each fruit separate but densely packed together, grey shading to orange, reminiscent of a mulberry in appearance (Aug.–Oct.).

The roots and leaves have been used to treat snake-bite.

4. STREBLUS Lour.

Streblus usambarensis (Engl.) C.C.Berg
Moz.

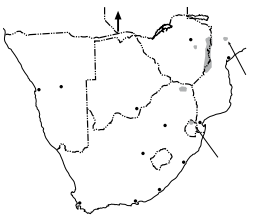




A shrub or small tree up to 5 m tall; occurring in forests, on forest margins and along streams. **Bark:** smooth, mottled grey, cream or pale brown; milky latex present. **Leaves:** simple, alternate, oblong to elliptic, 2–16 × 1,5–6 cm, hairless, apex abruptly attenuate, forming a slender drip-tip; base tapering to rounded; margins scalloped to toothed particularly near the apex, or entire; petiole shorter than 0,7 cm; stipules present. **Flowers:** borne in the leaf axils; sexes separate, can be on the same tree or on different trees; male spikes up to 5 cm long; female flowers usually solitary. **Fruit:** more or less round, about 1 cm long, black.

5. TRILEPISIUM Thouars

Trilepisium madagascariense DC.
[*Bosqueia phoberos* Baill.]
S.A. no: 45 **Urn-fig. Valsvy**
Zimb. no: 51 **Urn-fig**



Large trees reaching 20 m in height; occurring in riverine forest fringes and patches of evergreen forest. **Bark:** grey, smooth; milky latex present. **Leaves:** simple, alternate, elliptic, 7–14 × 3–6,5 cm, very dark green and glossy, leathery, lateral veins looping to form a sub-marginal vein; apex broadly tapering to rounded, finally abruptly attenuate and forming a narrow tip about 1,5 cm long; base broadly tapering to rounded; margin entire, rolled under; petiolate; stipules covering the very pointed leaf bud, but soon falling to leave a scar around the stem. **Flowers:** sexes separate, but both inserted inside the same bell-shaped, or urn-shaped receptacle; the receptacle, about 1,5 cm long, somewhat resembling a fig, but with a wide opening at the apex; male flowers many, perianth absent, stamens long, creamy white to mauvish, protruding from the apical mouth and forming a puff about 10 mm in diameter which might almost hide the receptacle; female flowers solitary and embedded in the fleshy receptacle, perianth absent, style with 2 or 3 lobes (Sept./Oct.). **Fruit:** a nut, embedded within the fleshy receptacle, rather fig-like, ellipsoid, about 2 cm long (Sept.–Nov.).

6. FICUS L.

A large and taxonomically difficult genus. Shrubs, trees or, rarely, climbers with latex, usually milky, present. **Leaves:** simple; spirally arranged, occasionally alternate or opposite; glandular spots in the axils of the main basal lateral veins below; petiole stops at the midrib and looks as though it has been stuck on; stipules frequently conspicuous, enveloping the leaf bud, but usually falling as soon as the leaves unfold, leaving a conspicuous, characteristic scar. **Receptacles (the figs):** growing out, up and over to form a hollow fleshy sphere, with or without a stalk, solitary, in pairs or in heavy clusters (panicles or fascicles); the apical pore is loosely closed over by minute bracts which may or may not be visible from the outside. **Flowers:** sexes separate, produced inside the hollow receptacle; male flowers with a 2–6-lobed perianth, overlapping, membranous, with usually 1 or 2 stamens, ovary absent or vestigial; female flowers with perianth lobes usually fewer and narrower than those in the male, stamens absent, ovary obliquely ellipsoid or ovoid, style usually lateral. **Fruit:** a very small nut.

A fig is called a 'synconium' (*syn* = with, *konos* = cone), defined as the 'hollow inflorescence axis of the fig', or a receptacle which has folded over, closed and become hollow with the flowers around the inside. The flowers are pollinated by tiny members of the wasp family. The wasp that pollinates the flowers of *Ficus sur*, a species with quite large figs (3–4 cm in diameter), is no more than 2 mm long. As a reward for pollinating the flowers of the fig the wasp is provided with a haven in which its young can mature, an example of a real symbiotic relationship.

At the end of the fig, opposite the stalk, is an opening called the 'ostiole'. This is covered by scales placed in such a way that it is impossible for anything to get out and very difficult for anything to get in. Only the pollinating wasp has enough determination to do so and often loses parts of her wings and legs in the process. The pollen is carefully tucked away in her pollen sacs and so is quite safe. Having gained entry, the female wasp takes the pollen from her pollen sac and deliberately pollinates the female flowers of the fig. Not only does she pollinate the flowers, but she also lays her eggs. Some flowers are intended to produce seed and have long styles. These are solid, preventing the wasp from laying an egg in them. Other flowers have short styles with an open canal so that the wasp can get her ovipositor into the ovules and lay an egg. Thus the tree has made provision both for its pollinator and for itself to develop seeds. The flowers in which the eggs are laid are stimulated to react by developing an abnormal growth, or gall. This provides food for the young. Then follows the normal life cycle of an insect: the egg hatches into a larva which, after having eaten enough, pupates and eventually emerges as an adult.

The first ones to do so are the males. They are wingless, eyeless and have very reduced legs, but are much more robust than the females. They identify which pupae contain the female wasps, open them, and then mate with the females. The males all get together and bore a hole through the fig wall to the outside world. The theory is that the fig is full of carbon dioxide and the need for oxygen stimulates the males to do this. The females, in turn, are roused by the atmospheric oxygen. They first visit the male flowers in the fig, now mature and full of pollen, and deliberately fill their sacs with pollen. Then they make their way through the hole made by the males and fly off to find another fig tree of the same species. Each species of *Ficus* has its own species of pollinating wasp.

The figs, as a fruit, do not ripen until about five days after the hole has been made and the oxygen let in, which allows for the development of ethylene. Thus, they are not eaten until after the pollinators have flown away.

For every species of pollinating wasp, there are often a number of wasps that parasitise them. The parasitic wasp lays her eggs through the wall of the fig into the flowers containing larvae of the pollinating wasp. She does not lay too many eggs, otherwise there would not be enough males of the pollinating wasp to let them out of their potential tomb.

All the indigenous figs are edible, if somewhat insipid. They are smaller and drier than the figs of the cultivated species, *F. carica* L., and lack their juicy flavour.

The figs are distinctive. By referring to their position on the tree, two main groups can be distinguished:

(a) Trees with large figs, 1,5 cm or more in diameter, borne on the stem or main branches, in small groups of 2 or 3, or in large, heavy, branched clusters.