

PLATE 1. *Eucalyptus oleosa* F. Muell. A to F—*var. longicornis* F. Muell: A—Branchlets with buds and fruits; B—Flower-bud in section; C—Anther; D—Fruits; E—Fruit in section (note the greatest width in the upper half); F—Cotyledons. G to I—*var. glauca* Maiden; G—Branchlet with buds and fruits; H—Flower-bud; I—Flower-bud in section.

Icon. origin.



# TREES OF WESTERN AUSTRALIA

By C. A. GARDNER, Government Botanist

## No. 18.—EUCALYPTUS OLEOSA F. Muell. and its Varieties

SOME species of *Eucalyptus*, especially those of a limited range, or which have some particular soil or climatic requirements, are easily distinguished as species and have more or less constant characters. Others, on the other hand, which enjoy an extensive range through gradual climatic changes, exhibit variations to such an extent that more than one species would appear to be in evidence, and it is only by thorough exploration and research that their limits of variation as species can be determined. When known only from specimens collected from widely separated localities, a different picture is presented, and thus a number of separate species have been described because of a lack of appreciation of the general distribution and characters which are of importance.

Typical of such a species is *Eucalyptus oleosa* which has received four distinctive names in its West Australian forms—*E. longicornis*, *E. transcontinentalis*, *E. Kochii* and *E. Grasbyi*. These, in the writer's opinion, are merely varieties of the one species, although they exhibit considerable variation, indeed to such an extent that they are only recognisable as such with considerable difficulty.

To the forester and the bushman, the red morrel (*E. longicornis*) is a totally different tree from the smooth-barked typical form of the Redwood (*E. transcontinentalis*) and these again differ in general from the narrow-leaved mallee which has received the name *E. Kochii*.

When it is realised that the trees named have mallee forms and that the normally smooth-barked redwood can, while retaining its distinctive bud and fruit characters, become a rough-barked tree indistinguishable from a red morrel—when it is further realised that its bud cap is not reliable as a character, and that

its blue-green leaves are sometimes quite shiny in appearance, it then becomes very difficult to retain it as a species.

These differences are actually encountered and for this and other reasons it is impracticable to keep the "species" separate. Were an attempt made to do so confusion would arise (this has actually occurred) and intermediate forms cannot be definitely named.

There are six more or less distinct forms of *Eucalyptus oleosa* in Western Australia which can, in general, be recognised in the field. With some of them, variations exist and we also find connecting forms which are perhaps hybrid in origin and confuse even the experienced botanist.

An attempt has been made in this article to illustrate these differences by a series of illustrations and to this end the following "key" has also been prepared, which, used in conjunction with the illustrations, will help the student to recognise these varieties.

### KEY TO THE VARIETIES

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|---|---|
| A. Pedicels (individual flower stalks) as long as or longer than the fruits.  |   |
| B. Operculum abruptly contracted into a slender beak; buds and fruits more or less powdery-white; leaves blue-green, not shining  | 1. var. <i>glauca</i> Maiden<br>( <i>E. transcontinentalis</i> Maiden)                              |
| B. Operculum shortly conical to elongated-conical, not contracted above the base; buds and fruits not powdery-white; leaves lustrous (shining) deep green   | 2. var. <i>longicornis</i> F. Muell.<br>( <i>E. longicornis</i> F. Muell)                           |
| A. Pedicels (individual flower-stalks) not longer than the fruits.  |   |
| B. Fruit hemispherical or subglobular; leaves deep green and lustrous; trees or large mallees of the Eastern Goldfields and areas to the south  | 3. var. <i>obtusa</i> C. A. Gardn.  |
| B. Fruit urceolate (see Plate II, Fig. 1), broadest in the lower half; trees or mallees of the Northern districts.  |   |
| C. Operculum conical, as long as, or nearly as long as the calyx-tube; calyx-tube at the time of flowering abruptly narrowed into its pedicel.  |   |
| D. Operculum contracted about the middle; leaves rather broad, lustrous. Tree with flaky bark   | var. <i>borealis</i> C. A. Gardn.   |
| D. Operculum not contracted at the middle; leaves narrow, somewhat dull; mallees with pale grey spirally-fissured bark  |   |
| C. Operculum hemispherical or depressed hemispherical, much shorter than the calyx-tube; calyx-tube at the time of flowering tapering gradually into the pedicel. Very young buds surrounded by early-falling bracts. | 5. var. <i>Kochii</i> (Maiden) C. A. Gardn.<br>( <i>E. Kochii</i> Maiden and Blakely)               |
| D. Mallee, erectly and densely branched; leaves dull green; fruits distinctly but shortly stalked   |   |
| D. Small tree or large mallee with spreading branches; leaves shining; fruits almost without a stalk  | 6. var. <i>plenissima</i> C. A. Gardn.<br>var. <i>plenissima</i> C. A. Gardn<br>forma <i>lucida</i> |



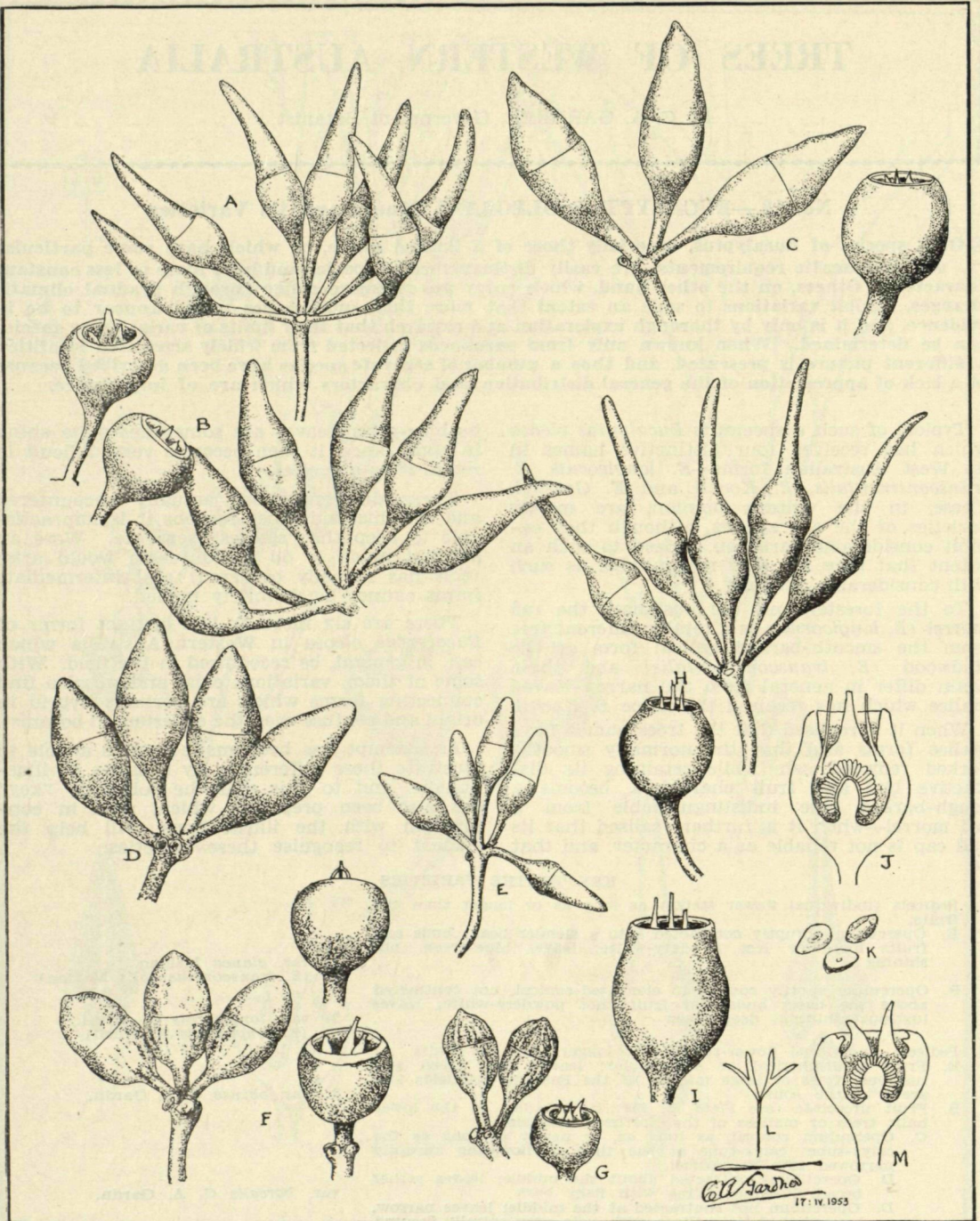


PLATE 2. *Eucalyptus oleosa* F. Muell. A to E—*var. longicornis* F. Muell: A—Flower-buds from Wagin (Gardn. 1234); B—Flower-buds and fruits from Westonla (Gardn. 1100); C—Flower-buds and fruit from Salmon Gums (Gardner and Brockway); D—Flower-buds from Tammin (Gardn. 1139); E—Flower-buds from Lake Barlee (E. Grasbyl-Fitzgerald Fraser). F and G. *var. obtusa* O. A. Gardn.; F—Flower-buds and fruits from Coolgardie (Gardn. 1839); G—Flower-buds and fruit from the Bremer Range (Gardner). H to L—*var. glauca* Malden; H—Flower-buds and fruit; I—Typical fruit (Widgelmooltha); J—Section of fruit; K—Seeds; L—Cotyledons; M—Section of fruit of *var. longicornis* for comparison.

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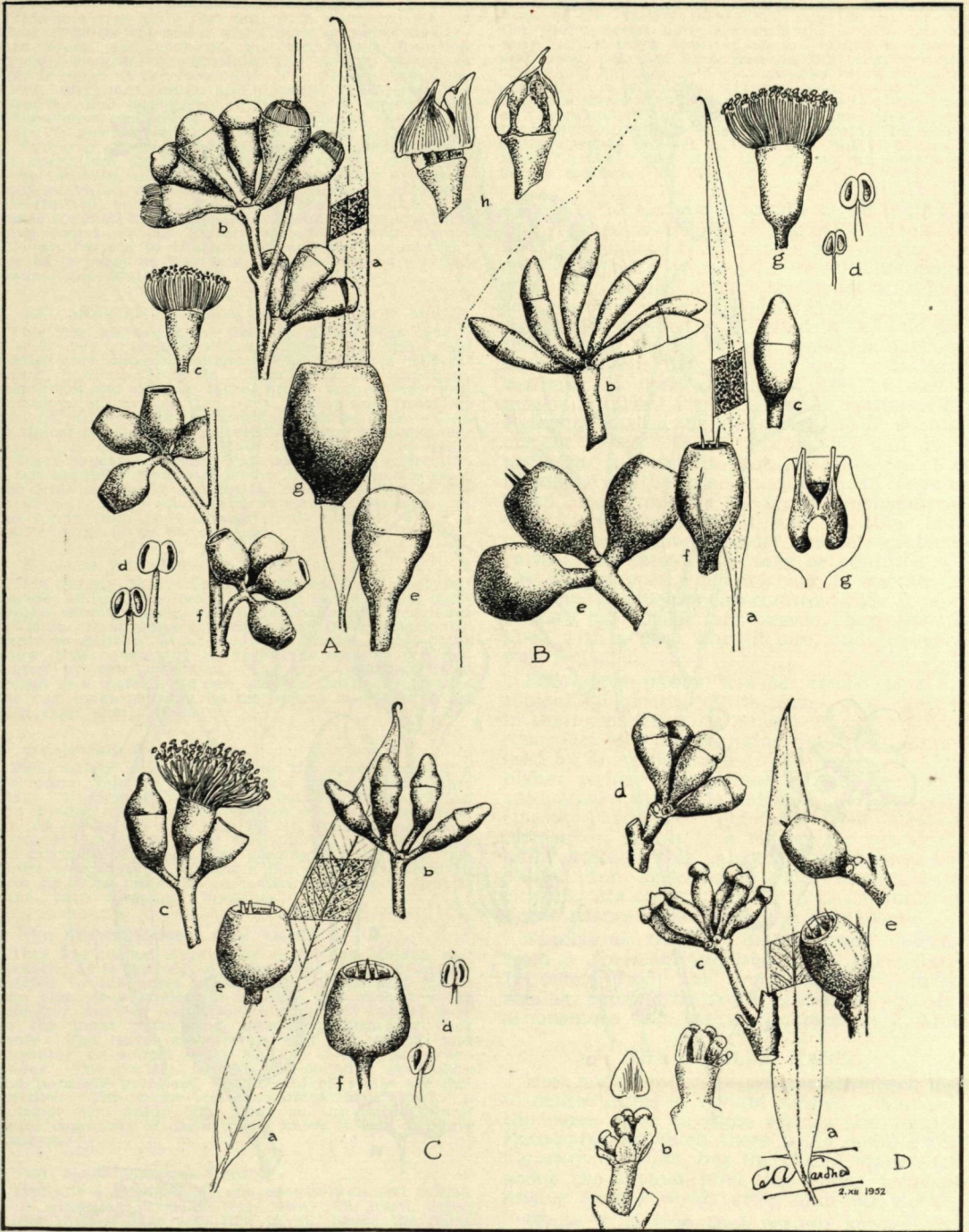


PLATE 3. *Eucalyptus oleosa* F. Muell. A—*var. plenissima* C. A. Gardn.; (a) Leaf; (b) Flower-buds; (c) Flower; (d) Anthers; (e) Flower-bud; (f) Fruits; (g) Fruit; (h) Cluster of buds surrounded by bracts. B—*var. Kochii* (Maiden) C. A. Gardn.; (a) Leaf; (b) Flower buds (immature); (c) Flower-bud; (d) Anthers; (e) Fruits; (f) Fruit; (g) Flower. C—*var. borealis* C. A. Gardn.; (a) Leaf; (b) Flower-buds; (c) Flower; (d) Anthers; (e and f) Fruits. D—*var. plenissima, forma lucida* C. A. Gardn.; (a) Leaf; (b) Young flower-buds surrounded by bracts; (c) Immature flower-buds; (d) Mature flower-buds; (e) Fruits.

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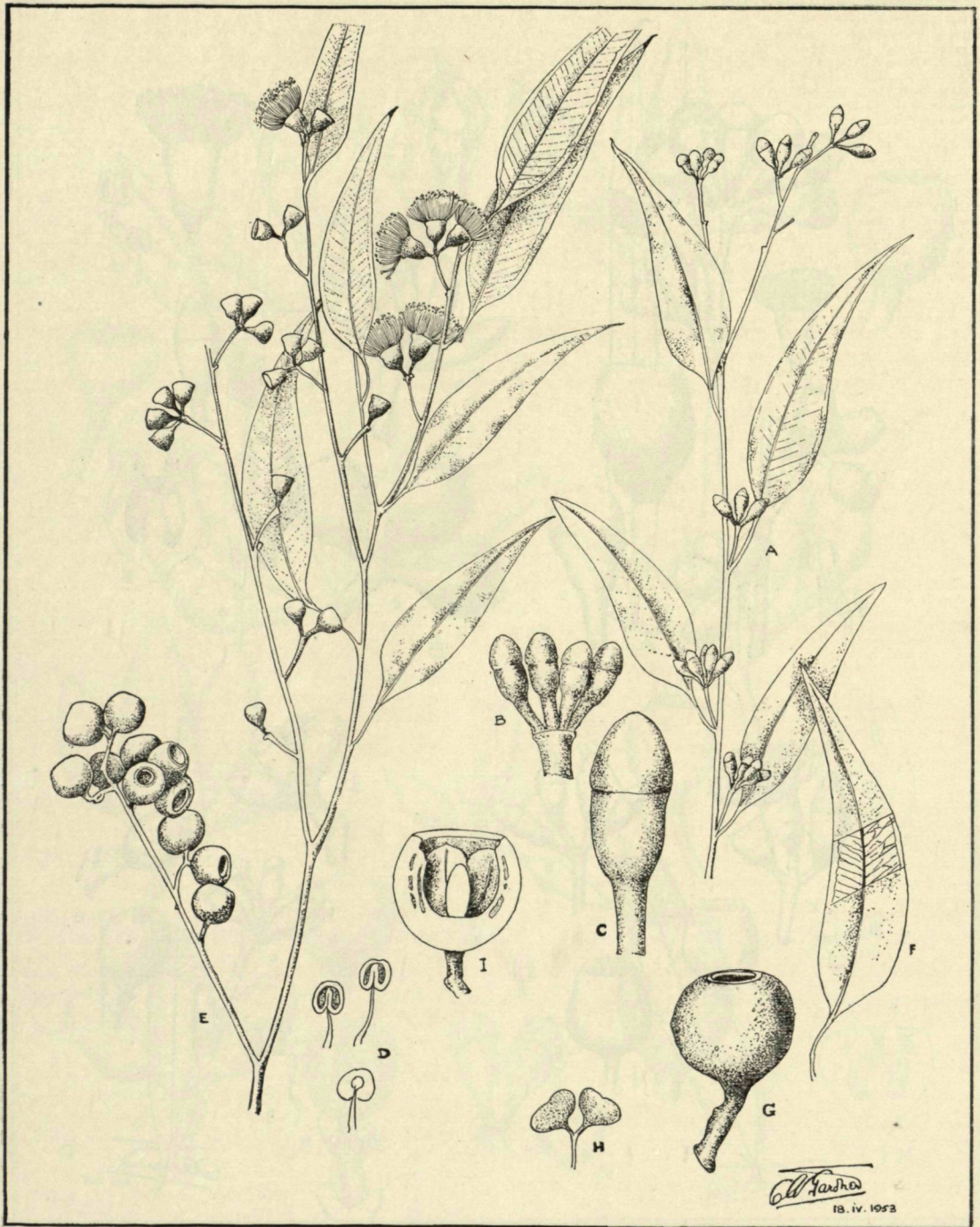


PLATE 4. RED TINGLE (*Eucalyptus Jacksonii* Maiden). A—Branchlets with leaves and flower-buds (immature); B—Umbel of immature buds (mature buds are unknown); C—Flower-bud; D—Anthers; E—Branchlet with flowers and fruits; F—Leaf showing nervation; G—Fruit; H—Cotyledons; I—Fruit in section.

Icon. origin.



1. REDWOOD (*E. oleosa* var. *glauca* Maiden.).

This is a tree 50-70 feet tall, with a smooth slender trunk of 30-40 feet and a white bark, or sometimes the bark rough and grey on the trunk, the branches typically smooth, or sometimes the bark in Goldfields trees is rough at the base only. The timber is reddish-brown, very hard, tough and durable. The leaves are spreading, and blue-green or glaucous in colour. The inflorescence, including the flower-stalks, buds and fruits, is powdery-white. The calyx-tube at the time of flowering is somewhat campanulate (bell-shaped); the operculum somewhat broader than the calyx-tube above the base, and abruptly contracted into a long or short somewhat slender beak. The fruits are urceolate, thin-rimmed, and on rather long, slender stalks. The tree is common in reddish sandy loam, the typical form being found on the Eastern Goldfields, from Comet Vale southwards to Higginsville, and as a morrel-like tree as far west as Westonia. Mallee forms are found towards the south coast.

2. RED MORREL (*E. oleosa* var. *longicornis* F. Muell.).

This tree, known in the southern districts as "Poot", is 60-80 feet in height, with a rough-barked trunk and reddish-grey smooth branches. The timber is reddish-brown, hard and durable. The leaves are spreading, deep green and shining, rather broad, and covered with numerous oil-cavities. The buds, flowers and fruits are on long pedicels, and the operculum varies from conical to almost horn-shaped, but exhibits some variation (see Figs. A, B, C and D, in Plate 2). It lacks the white powdery appearance of the redwood, and the operculum is not abruptly contracted above the base into a beak. The fruit is usually distinctive, being broadest in the upper half, or sometimes almost globular, especially in the forms from the Salmon Gums district, where a mallee form is to be observed.

3. *E. oleosa* var. *obtusata* C. A. Gardn.

This variety is a tree or a mallee, usually of fair stature, and differs from the morrel in its obtuse operculum, short pedicels, and hemispherical or subglobular fruit. It is found extending from Coolgardie southwards to Salmon Gums and the Bremer Range. We know little concerning its variations since it is represented by few specimens. On the Goldfields it is known as a morrel, and can only be distinguished from the var. *longicornis* by its distinctive buds and fruits with their short stalks.

4. var. *borealis* C. A. Gardn.

This variety when a tree has the appearance of a red morrel, but the bark is darker in colour and more flaky. It occurs in the districts between Canna, Gutha and Pindar, and has the foliage of the morrel tree, but its leaves are very rich in oil, and its operculum is somewhat contracted at the summit, and the fruits are distinctly urceolate, i.e., globular at the base, but contracted upwards. Compare figs. F and G, plate II, with fig. C in plate III. A mallee form occurs, but is large, with spreading branches.

5. var. *Kochii* (Maiden) C. A. Gardn.

This was named *Eucalyptus Kochii* by Maiden and Blakely. It is typically a mallee, and more or less restricted to the areas between Dalwallinu and Kulja. The plant is a mallee, or a small tree with a rough pale-grey, more or less fibrous and spirally-twisted bark on the lower parts, and smooth reddish-grey bark above. The leaves are narrow, and rich in oil, and spreading or almost erect, and of a dull pale-green colour. The conical, usually pale-coloured operculum and narrowly urceolate, shortly-stalked fruits are distinctive. The name commemorates Max Koch, a collector who found this plant on the Rabbit Proof Fence eastwards of Dalwallinu, where it was formerly common.

6. var. *plenissima* C. A. Gardn.

Typically a very densely and erectly branched mallee, it is sometimes a small tree, with dull green, erect, rather thick foliage very rich in oil, hence the name *plenissima*. It can be distinguished by its calyx-tube in the flowering stage tapering into the pedicel, and by its short and very obtuse operculum, together with the presence, when in very young bud, of a number of scale-like bracts which surround the young buds, protecting them before later development. The fruits are those of the variety *Kochii*, and shortly stalked.

This variety occurs in the Kalannie-Kulja districts, extending eastwards to Beacon, Campion, Carrabin, Warralacking, and southwards to Dowerin, Nembudding, Yorkrakine and Hiae's Hill.

The form *lucida* is very closely allied to the typical form of the variety *plenissima*, but the foliage and the young flower buds are shining. It also has the early falling bracts observed on the variety *plenissima*, and these have not been seen on the other varieties. The young flower buds are constricted below the blunt operculum in a curious manner, and the fruits are almost without stalks. This form is usually a small tree or a large mallee with spreading leaves, and this character lends it a distinctive aspect in the field. The area of distribution is not yet fully known, but it occurs in areas further inland than the typical var. *plenissima* as far eastwards as Wiluna.

*Eucalyptus oleosa* can usually be distinguished from related species by its typically globular or urceolate smooth fruits with a narrow rim and deeply included valves, the needle-like points of which protrude, but are somewhat brittle and easily broken off in the older fruits. The filaments are incurved or inflected in the bud, and the anthers are short and broad, attached to their filaments by the back, and open longitudinally in short parallel slits. The species, especially inland forms, has been confused with *E. leptophylla* on the one hand, and *E. uncinata* on the other. In *E. leptophylla* and in *E. uncinata* the anthers are attached to their filaments at the base, and open in terminal pores. In *leptophylla* the fruit is hemispherical to globular-hemispherical, with a rather broad rim and much more slender, scarcely protruded valves; this species also may be confused with the salmon gum when its bark is smooth. In *E. uncinata* which is also confused with *E. leptophylla*, the fruits are sessile, barrel-shaped lined with a deep whitish disc, and the valves well included.

*Eucalyptus oleosa* was so named from the copious oil cavities of its leaves, first observed in the forms from the Murray River in Eastern Australia, and the Pinnaroo mallee was largely used for the production of eucalyptus oil. Even higher yields (the highest of any species investigated) with the highest percentage of cineole have been obtained from the var. *plenissima*, and it is a matter for regret that large areas of this valuable variety have been cleared for agriculture. The stumps, after clearing, are easily uprooted by the plough, and hence natural regeneration is very poor.

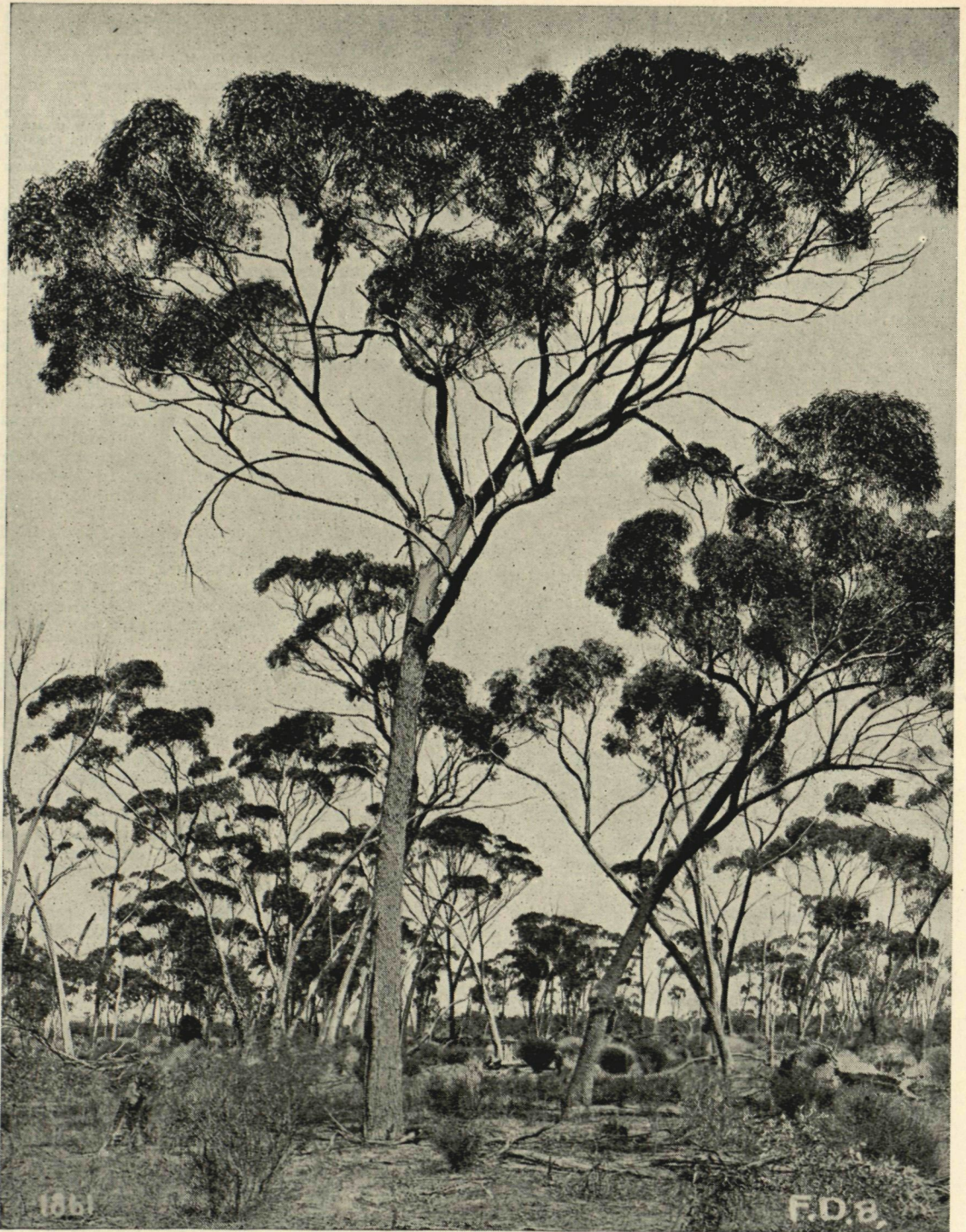
*Eucalyptus Grasbyi* Blakely, was described from a fragment received from Lake Barlee. It differs from the var. *longicornis* in the smaller buds. The fruits are unknown. It is synonymous with the var. *longicornis* F. Muell.

## THE MALLEE HABIT

Here and elsewhere references have been made to mallee forms of certain species. "Mallee" is the name given to those species and forms of *Eucalyptus* in which there is no definite leading stem or trunk, but the plants branch from about the ground level, the stems frequently arising from a woody often bulb-like stock.

While it is true that certain species never possess a mallee form (e.g., karri, salmon gum, gimlet, etc.) others, like the jarrah, and several inland species, especially *Eucalyptus dumosa* and *E. oleosa* occur as trees or as mallees. In many cases the mallee form in such species is entirely the result of circumstances: a tree (especially those forms which have a dilated base to the trunk) after injury, say from fires,





The Red Morrel (*E. oleosa* var *longicornis* F. Muell).

Photo—E. H. Wilson,  
By courtesy of the Forests Dept.



termites, or as a result of cutting down, may produce a number of coppice shoots from its stock or base, and these, or at least the stronger shoots, develop as independent mallee stems. The term mallee is therefore often of loose application.

Certain species of *Eucalyptus* are found only in mallee form. These are characteristic of the dry regions, or regions of dense shrub or thicket, and there is a distinct probability that fires have been a factor in the development of this type of growth.

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### No. 19.—THE RED TINGLE (*Eucalyptus Jacksonii* Maiden)

**A**LTHOUGH not perhaps as tall as the largest karri trees, the red tingle is certainly the largest in girth of any of the *Eucalyptus* trees of Western Australia. Attaining a height of upwards of 200 feet, the trees swell out towards the base, and a girth of 66 feet has been measured at the ground level by the writer. The tree closely resembles the jarrah or the blackbutt in appearance, but is much larger than either, and its grey, fibrous, persistent, furrowed bark is often blackened in the lower parts by fire. There is, however, a certain red character in this bark, which is more friable than that of the jarrah.

In its buds, anthers and fruits the tree stands in close relationship to both the jarrah and the blackbutt, but its leaves are different. They are dark green on the upper surface, and much paler below—a character which indicates a leaf of a horizontal position, and is illustrated also by the karri tree. The timber is like that of the jarrah, red in colour although perhaps somewhat paler, and much lighter in weight. It will probably be preferred to jarrah for cabinet work on this account, but the presence of gum cavities is said to affect the value of this otherwise most desirable hardwood.

The red tingle tree (the full native name is tingle-tingle), has not an extensive range. It is found in high forest along the lower reaches of the Deep, Frankland and Bow Rivers, growing mostly on the hills. Examples growing between the Bow and Frankland Rivers are familiar to tourists. The tree commemorates the name of Sydney W. Jackson who collected specimens about 1912. Forester Brockman, who inspected the area shortly afterwards, drew attention to its similarity to the blackbutt, and subsequent work has confirmed this statement. Compared with the jarrah tree, points of interest are its much smaller fruits, smaller buds with obtuse caps, its stalked cotyledons, and its broader leaves of thinner texture and of different colours on the two surfaces, as well as its much more spreading lateral nerves. There is a tendency for the flowers and fruits to be arranged in panicles, but these, it should be noted, are not terminal in origin, but owe their character to leaf suppression, since the branchlet often terminates above the flowers.



A fire-hollowed Red Tingle in "The Valley of the Giants".

Photo—J. A. Mallett.





Red Tingle forest.

Photo—E. H. Wilson,  
By courtesy of the Forests Dept.

## PROGRESS AT KIMBERLEY RESEARCH STATION

**O**NE hundred and fifty varieties of rice are now under test at the Kimberley Research Station. After some difficulty many of these varieties have been secured from rice-growing countries outside Australia. Several appear better than any varieties previously tried for Kimberley conditions but they cannot be tested on large areas till seed supplies are built up.

Sugar cane is another crop receiving particular attention and 15 acres are being grown this year. Ten acres planted last August are now seven feet to nine feet high. It is being grown under irrigation on "black" soil.

Considerable experience has also been gained in the past two years with grain sorghum, peanuts, cotton, sunflower, safflower, linseed and the fibre crops, jute and kenaf. Several types of irrigated pastures including paspalum, scrobiculatum, para grass and the legume clitoria have also been grown and grazed by cattle.

The Kimberley Research Station is controlled jointly by the Commonwealth and Western Australian Governments, and is primarily concerned with how best to use "black" soil under irriga-

tion. Its results will be of importance not only in respect to the Ord River Valley but also in the development of agriculture in North Australia.

## SHEARING AND WOOLCLASSING INSTRUCTION IN FARMING AREAS

**D**EMONSTRATIONS and instruction in shearing and woolclassing will again be carried out in the agricultural areas this year. This practical instruction has proved very popular and of considerable assistance to farmers, and in view of this and the applications already received this year, it has been decided to continue with this work.

An itinerary is now being arranged, so that as wide an area as possible may be covered and immediate applications are requested from those centres wishing to be included in this itinerary. It will not be possible to visit all districts and early applications will be given priority.

Applications should be made by local farmers and junior farmers' organisations or similar interested bodies, or persons to Sheep and Wool Branch, Department of Agriculture, Perth, or to the District Agricultural Adviser.