

## A Sterile Eucalypt

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(WITH 1 PLATE)

### SUMMARY

A single tree of an unnamed species of *Eucalyptus* showed a genetic abnormality which prevents abscission of the operculum from the buds. The tree is seed sterile but the buds may persist on the tree for four years.

Two populations of a *Eucalyptus* species are known from the east of Tasmania. The trees are closely related morphologically to *E. ovata* and *aggregata*. The umbels are seven-flowered and the adult leaves symmetrical and broad like those of *E. ovata*. The juvenile foliage resembles that of *E. aggregata* in the elliptical shape. The leaves are, however, much larger (up to 2" long). The fruit and bud shapes are different from those of *E. ovata* and *aggregata*. Instead of the conical shape so characteristic of these two species, the buds are more cylindrical and the fruit truncate-ovoid or ellipsoid (see plate). Pending further study of the natural populations, the exact taxonomic status of the form must remain in doubt. They occur on the granite hills behind Bicheno and about 4 miles north of Cranbrook on the road to Bicheno. The two known populations are thus about 15 miles apart. The trees are stunted mallees rarely reaching 15 feet high.

Among the Bicheno population one sterile tree was observed in February 1952. At first sight it appeared to be covered with "fruit" of a peculiar shape. There were four age classes of these structures. On the ordinary trees nearby there were three age classes of fruit and one of buds. (see plate). The fruits on these trees dehisced normally a few days after collection. Those on the sterile tree do not dehisce.

Dissection of the abnormal "fruits" showed that they were overgrown buds, complete with operculum which never falls off. In the three older age classes, the operculum covered shrivelled and dead stamens, which were still arranged in the way characteristic of buds with the anthers bent inwards and downwards towards the base of the style. The style although dead appeared normal in structure, projecting straight up from its attachment to the ovary so that the stigma was placed in its normal position close beneath the apex of the operculum. The anthers contained dead pollen grains which, however, had a normally developed shape and wall structure. No signs of their having germinated were observed, although germination has sometimes been observed of pollen grains in the anthers of *E. risdoni* and *salicifolia*, when mature buds are kept in stoppered glass tubes. Buds of the youngest age class agreed in all visible particulars with those on normal trees.

The ovary of the overgrown buds was not as large as that of mature fruits; but it was considerably larger, as was the operculum than that of mature buds. Some growth of the unopened buds must therefore take place in the period after they would normally have opened. This growth is not caused by self-pollination in the unopened buds. No fertile seed could be found in buds of any of the four age classes. The carpels of the three older age classes contained the shrivelled remnants of ovules, resembling the sterile "chaff" which always accompanies fertile seed in the Tasmania species of the *Macrantherae*.

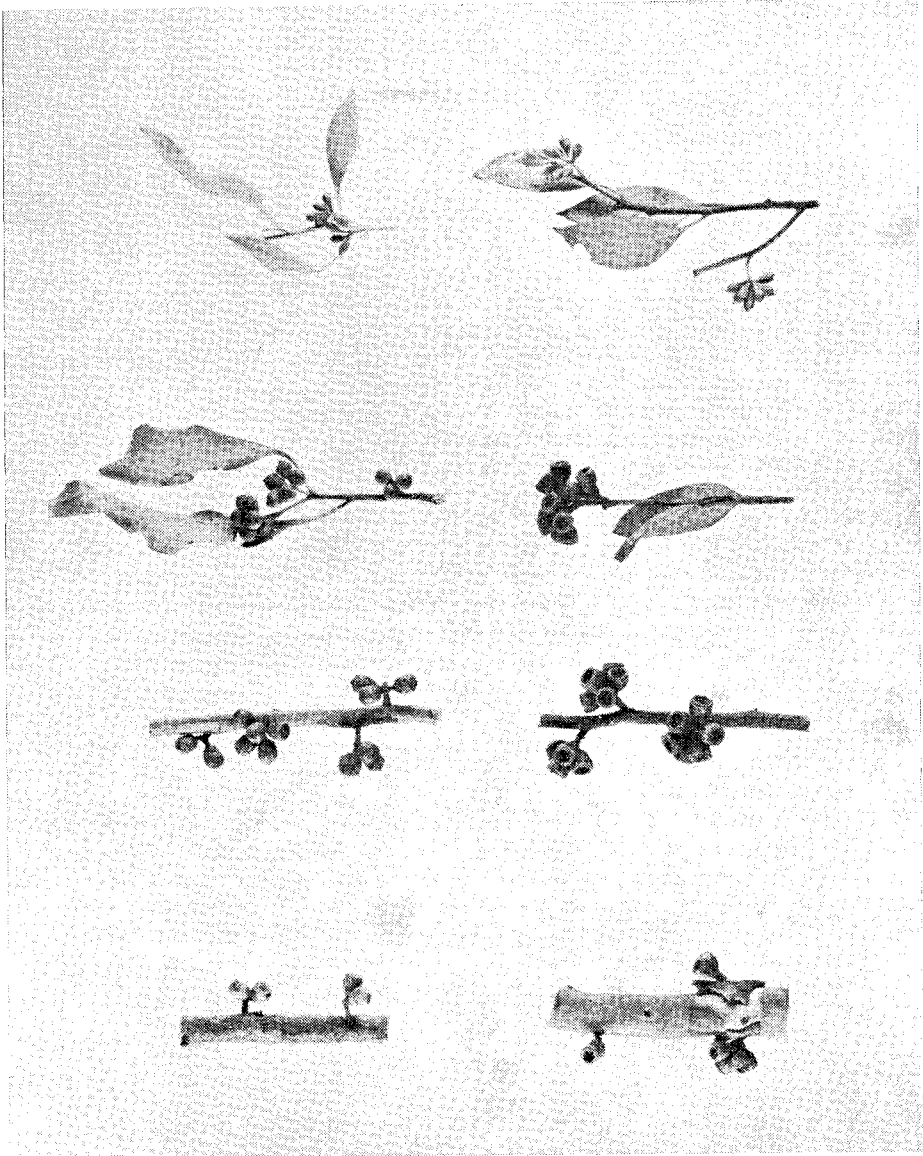
In longitudinal sections (kindly cut by R. H. Cruickshank) of the buds of all age classes, no trace of the abscission layer between operculum and ovary could be seen. In normal buds the abscission layer is difficult to see until just before the buds open when it is visible as a line of weakness, the cells tending to separate during cutting at this level.

The sterility of this tree, thus, appears to be caused by some derangement in the normal mechanism for abscission of the operculum. Mr. W. D. Jackson has noticed a sporadic failure of the operculum to abscise in several alpine species, e.g., *E. urnigera* and *subcrenulata*. An occasional bud in these species may retain its operculum attached either completely or, more usually, only over a part of its circumference. This persistence may be caused by frost or insect damage to the abscission layer. In the Bicheno tree, the derangement is complete. The tree had several stems each loaded with thousands of unopened buds. No normal fruits were present. Injury by insect attack was no greater than on normal trees. The developmental abnormality is, thus, due to genetic causes. Possibly, it might be caused by a single recessive gene.

It appears that the unopened buds can remain attached to the tree even for as long as four years. It is probable that bud formation in this tree and in this population is annual as in most eucalypts. If this is the case the four age classes would represent four successive crops of buds, the youngest of which would presumably be ready to open, if the genotype allowed it, in a few months time. The oldest crop of unopened buds (like the oldest crop of fruits on normal trees) would be between three and four years old. It is surprising that unpollinated buds should remain so long on a tree. In eucalypts with normally opening flowers, unpollinated flowers rarely persist longer than a month after the operculum falls. An abscission layer develops at the base of the pedicel of unpollinated flowers. It may be that, in the sterile tree, the gene causing failure of abscission of the operculum has a correlated (pleiotropic) effect on the formation of the abscission layer in the pedicel. However, abscission of the leaves, when they are about two years old, follows the normal course.

Some of the earlier workers with *Eucalyptus*, e.g., Muller, suggested, on the bases of the peculiar morphology of the operculum that eucalypt flowers were adapted for self-pollination even before the flowers opened. The existence of this tree and many other facts of floral biology, e.g., the pronounced protandry in many species, show that this view is incorrect.

The nomenclature used in this paper is that of Brett (these proceedings for 1937, p. 75), for reasons given in detail in my notes of 1952 and 1953 (*Australian Journal of Science* 14, p. 148 and 16, p. 9).



*Bottom row* from right to left, half-grown buds, one year, two year and three year old fruits of Bichenó eucalypt—normal tree.

*Top row*, half-grown buds, one year, two year and three year old buds from sterile Bichenó eucalypt.

