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THE BOTANY OF THE HILL RIVER DISTRICT

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The flora of South-Western Australia is remarkable for the high degree of endemism amongst its species. In different places we find plants with a restricted habitat which occur nowhere else, sometimes confined, apparently, to a few acres of ground. An example of this type of thing may be observed on the Stirling Range, where most of the higher altitudes have their own distinctive species of *Darwinia,* each in turn being restricted to its own particular peak at certain levels. The reason for this type of endemism is not clear, it is certainly not only a matter of altitude and soil, for several of these peaks, close to one another, possess these characters in general, nor are we to attribute the cause to distance, for the distances separating them are so small.

The highest development in the flora of the South-west Province (which extends from the Murchison River to Israelite Bay) takes place in sand, whether it be the pure detritus which we find on the coastal heaths, or the deep yellow sand of the interior, or the mixture of laterite and sand occurring in certain areas. In all cases it is the ancient, excessively leached soils that are so rich in species, and the sand-heaths of South-Western Australia are world-famous in this respect.

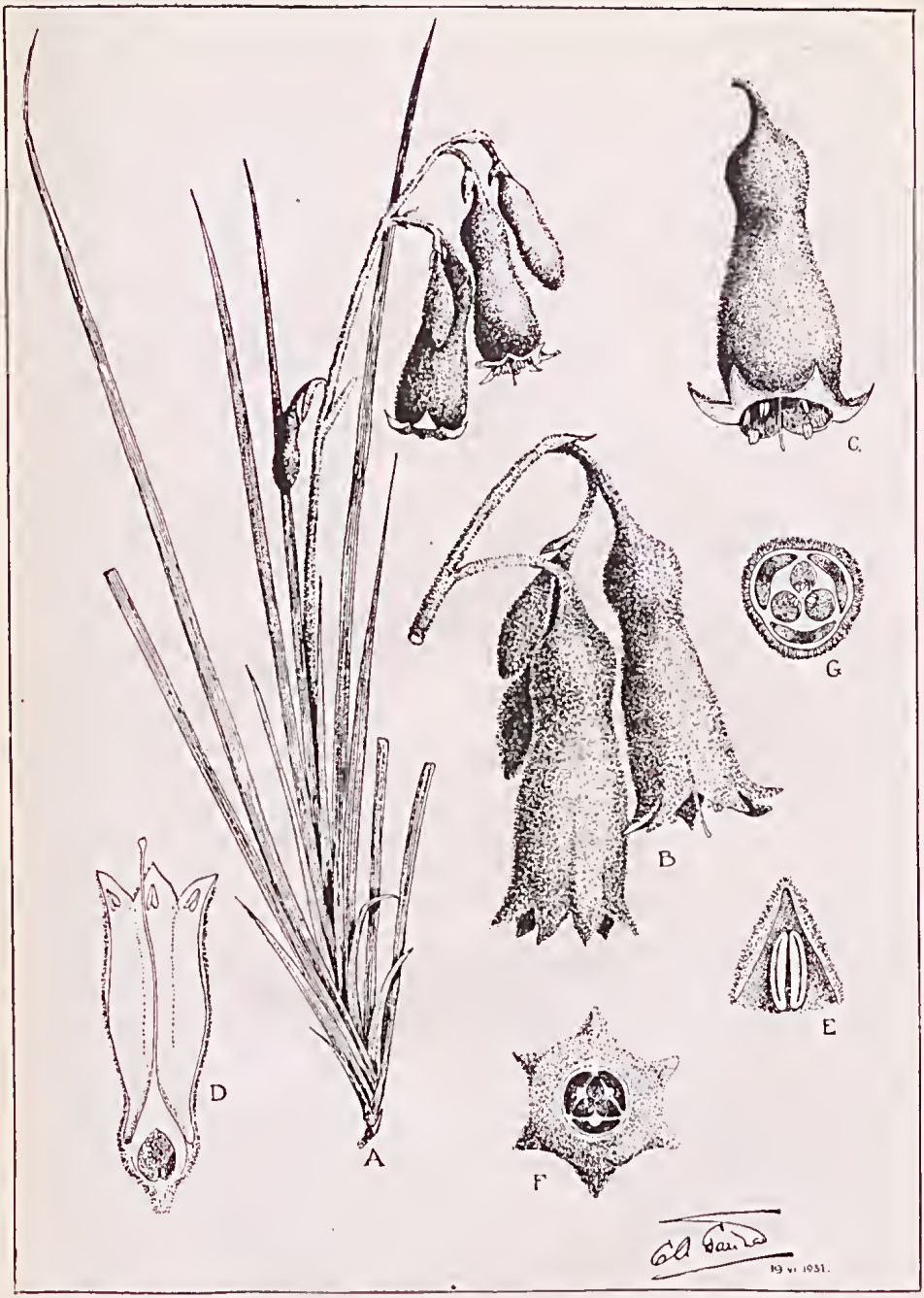
Large areas of sand-heath, extending over a great number of miles in every direction, occur in a number of places, but the two which are the most notable are, firstly, the one which extends from the Murchison, almost to the Moore River, not far from the coast; the second being that which covers the ground almost uninterruptedly from the Stirling Range to Israelite Bay, with its greatest dimensions centreing around Middle Mount Barren, and around Cape Arid. Further, there is a marked affinity between the plants of the two tracts, so widely separated in geographical miles, and although in most cases these relationships are expressed in affinities amongst the component species, in other cases there are plants common to the two areas, with no representatives between them. An example of the former is the genus *Phymatocarpus,* and examples of the latter are found in *Eucalyptus tetragona* and *Adenanthos cuncata.*

James Drummond, who made six collections of the plants of Western Australia between 1839 and 1848, explored little of the

great southern area in question, his eastern limit being about the spot where Ravensthorpe is today, but he traversed, and collected in some detail between the Moore and Murchison Rivers, and apparently there is little that escaped his keen collector's eye except those plants which were not in bloom at the time of his visit. His trip occupied about two years. He does, however, remark upon the richness of the flora between these two streams, and it was here, that as a collector he found his El Dorado. Few geographical names were in existence, but in his letters to Sir William Jackson Hooker, he mentions in particular the Gairdner Range (south of Mount Lesueur), Mount Lesueur, the Diamond of the Desert Spring, and the Valley of the Lakes—the middle course of the Namban Creek. In addition we have Tea-tree Swamp, near the Irwin River. Drummond's account of some of the plants encountered is exhilarating reading, and it is quite evident that he regarded this trip as the most profitable of any that he made. *(Hooker's Journ. Bot.,* 1849-1860.)

I first visited Mount Lesueur and Cockleshell Gully in June 1931, on a brief trip lasting less than forty-eight hours, but the material collected during this all too brief period, during the month of June, was sufficient to indicate that here was a collecting ground of considerable interest and importance. Other visits were made in June, 1935 and January 1941, both of them also brief. Lastly, in October 1946, in company with Messrs. K. Sheard and R. Smith of the C.S. and I.R., I spent two days examining Mount Peron, Mount Lesueur, Cockleshell Gully, and the extensive sand-heath to the north of the Diamond of the Desert. The season was unfavourable, since most of the plants were past blooms, and much of the time was spent in trying to locate some of Drummond's rarer plants, two of which we were able to find—*Asterolasia phebalioides* and *Isopogon tridens.* In spite of this however, two new plants were discovered, one, a species of *Xanthosia* which excels the noted "Southern Cross" of the southern heaths, the other a species of *Gompholobium.*

A few miles north of Dandarragan, when we pass over the Moore-Hill divide, a strange change occurs in the landscape, at first evidenced by the masses of the black kangaroo paw *(Macropidia fuliginosa)* and a number of *Grevilleas.* Mile after mile, as the southern branch of the Hill River is traversed, we encounter more and more of these remarkable plants, until, close to the confluence of the south and east branches of the stream, a wealth of forms is found; *Banksia candolleana, Eremaea violaeea* with flowers of a rich deep violet, and *E. beaufortioides* with blooms of a rich orange, and flower-buds covered with a thick gummy substance. Here too, are two or three yellow-flowered species of *Hypocalymma,* and the amazing *Leschenaultia hirsuta.* I say "amazing", because of the intensity and brilliance, also the size of its remarkable flowers which are reminiscent of some gigantic *Gilia,* or a red-flowered *Mimulus.* The Proteaceae appear in a surprising richness of forms, all of which are endemic and of



THE WINTER BELL (Blancoa canescens Lindley) . . . Although found in two other very localised spots, this plant is common around Mount Lesueur, covering an extensive area at the western foot of the eminence. Further, its flowers are better developed, and of a richer tone than those further to the south.

great interest. Both the gravelly and the sandy soils are rich in many forms. To the immediate north stand the green hills of the Gairdner Range, and to the north of these in turn Mount Lesueur stands sentinel-like, visible for miles around, and from the sea, sister to Mount Peron, another eminence to the north. In October last, both of these hills were ascended, and a comparison made between their respective floras, the results of which will be published later. Peculiar to Mount Lesueur are *Banksia tricuspis, Hakea megalosperma* (not yet found in flower), *Hakea neurophylla* and *Asterolasia phebalioides*. Plants common to the two hills are several in number, and it is surprising that they should be so confined. But the richness of the local flora is not confined to these two hills, the intervening country, mostly sand and gravel, forms as it were a vegetative oasis which is a delight to the botanist.

It is, as it were, holy ground, upon which the only previous botanical footsteps were those of James Drummond, and we walk carefully, trying to follow his steps. We find exactly where he collected *Leucopogon plumuliflorus; Hakea megalosperma, Hakea neurophylla* and *Banksia tricuspis* are just where he stated that they were a century ago, but where is *Asterolasia phebalioides?* The directions are, "along the watercourse on the east side of Mount Lesueur". But there are four deep gullies here, and a search along each of them fails to reveal this species, so imperfectly known, and represented in the great herbaria of the world by mere fragments. It is tiring work walking up and down the steep slope, but always there is the hope that next time we visit the area it may be found.

Other plants of the district of special interest are the quaint species of *Darwinia* which spread themselves on the sand—*D. sanguinea* and *D. speciosa* with narrow purple-red and green involucres. It is here too that we find the remarkable *Hakea flabellifolia* with its fruits mottled purple and emerald green, and almost hidden at the base of the stem; *Actinostrobus acuminatus* spreading to a diameter of six or eight feet, but less than twelve inches in height; *Dryandra Shuttleworthiana,* and so on. One of the most spectacular, is *Daviesia epiphylla,* the stag-horn shrub, with broadly winged blue-green stems and large coral-pink pea-flowers which occurs only in a few places in the gravel. A powerful rival to the famed "Southern Cross" of the south *(Xanthosia rotundifolia)* is the handsome undescribed species which trails over the rocks of Mount Lesueur, and more especially Mount Peron. Particularly abundant there it must have escaped the attention of Drummond only because of the incidence of its flowering season, for few more handsome plants exist. West of Mount Lesueur are masses of *Blancoa canescens,* smaller, but more brilliant in its blooms than the plants from near Maida Vale, to which district it was formerly supposed to be restricted. There are also a large number of species of *Stylidium* amongst which *S. crossocephalum* is common.

To the north lies Cockleshell Gully, a limestone gorge with a permanent stream, in the recesses of which we encounter *Hibiscus Drummondii,* masses of the large white everlasting *(Helichrysum bracteatum* var. *albidum),* and the wild grape *(Clematicissus angustissima).* Northwards again lies the Diamond of the Desert Spring, where Drummond collected the rare *Banksia elegans,* a small gnarled tree with grey leaves having purple venation, pale yellow flowers in globular heads, and wax-covered tuberculated fruits. It is still there, but depauperate, and cannot be found in fruit. Here are masses of what we might term the most handsome of all the Western Australian flora—*Pileanthus filifolius,* a small shrub with masses of blooms of a geranium red colour, each flower the size of a shilling. It blooms in the height of the summer, and has very delicate petals. Its massed effect is noteworthy. Here too we find *Verticordia grandis* with blossoms of a bright scarlet, and with it grows *V. oculata* with silvery-lilac flowers. The Diamond of the Desert spring is the type locality for *Isopogon tridens,* but a search for this has so far proved unsuccessful. The great heath which extends for many miles to the north leads to the Valley of the Lakes, the broad middle course of what is now called the Namban Creek. Near here is Three Springs, where in the red sand we discovered more *Banksia elegans,* but no fruits.

The Namban Creek about eighteen miles from the coast enters a deep and narrow course in the limestone, and disappears from view, to emerge under the sea at Fresh-water Point. The entrance is by means of two short tunnels, each with an internal diameter of about forty feet. The scouring of winter floods has robbed the banks of their herbaceous vegetation, but the rocks are covered with green slime, and the temperature within is cool—cold, in fact. Bees have taken advantage of the coolness and freedom from enemies provided by the roof of the tunnel, several hives being in evidence. The main track to the north passes over the first tunnel, and one would certainly not suspect travelling over a subterranean watercourse were it not for the appearance of the flowering tops of *Eucalyptus rudis* protruding from the heaths to left and right. The final tunnel entrance has a dark and forbidding appearance. Limestone rocks strew the floor and sides, and up above are thickets of the Geraldton Wax plant *(Chamaelaucium uncinatum)* still in full bloom at the end of October.

The above is a very brief survey of some of the more interesting plants of the district. The question that now arises, is, what is the reason for this segregation of localised endemics in this area. The answer to this is difficult to postulate. It is largely the question of an ancient area, and the geological complex, for here is the old plateau, evidenced by Mt. Peron and Mount Lesueur, with an extensive dissection, resulting in various soil types in which the ancient species have held their own, and in which the variety given to the environment is sufficient for the support of species

having different soil requirements. At the same time we cannot overlook its relationship with the southern area between Cape Riche and Israelite Bay, especially in connection with its conjunctive species—*Eucalyptus tetragona* and *Adenanthos cuneata*, and here we are forced to the belief that these plants remain as vestiges of a formerly more common area of distribution. What the factors involved are, we do not know, perhaps an inability on the part of more aggressive species to colonise the area, or a certain fitness on the part of the plants concerned to thrive under these peculiar conditions. Whatever the answer, the fact remains that the Hill River-Mount Lesueur district remains as one of the most interesting, and fortunately one of the most inaccessible regions of the South-West.

I am indebted to Mr. F. Gregson of Cockleshell Gully for valuable assistance in visiting some of the remote areas mentioned in this account and also for his freely-imparted information.

Explanation of Plate.—A, Habit (reduced). B, portion of inflorescence. C, flower. D, section of flower. E, anther. F and G, section of ovary.

BIRDS OBSERVED AT SEA IN 1938

By L. GLAUERT, W.A. Museum, Perth.

The ocean traveller who is the fortunate possessor of W. B. Alexander's "Birds of the Ocean" and a good pair of field-glasses can spend many happy hours watching the sea-birds that come into view. But if he has neither of these or one only, then he is greatly handicapped, as I found to my cost during my outward voyage to England in 1938, when I had to depend upon the naked eye.

On the trip to Sydney, which commenced on March 21, little could be recorded. The Yellow-nosed Albatross (*Diomedea chlororhynchos*) was abundant off the south coast from Cape Leeuwin until Albany was left behind, when it soon disappeared. Several Albatrosses were seen when crossing the Great Australian Bight; some large blackish birds could not be identified though one which came nearer to the vessel turned out to be a Giant Petrel (*Macronectes giganteus*). Passing along the coast of New South Wales, I was impressed by the relative scarcity of gulls and terns and the abundance of skuas, both the Southern Skua (*Catharacta skua*) and Richardson's (*Stercorarius parasiticus*) being identified with certainty.

In the vicinity of the Three Kings Islands, off the north of New Zealand, a number of petrels were seen flying in dirty weather though too far off to be recognised. On April 18, Auckland Harbour provided a surprise with its tame gulls; the large Black-backed Gull (*Larus dominicanus*) seemed to favour the