South African Journal of Science, *Vol. XXVI, pp. 154-159, December, 1929.*

# REMARKS ON THE REALM OF THE CAPE FLORA.

BY

R. Marloth, M.A., Ph.D.

---

As an historical introduction to the vegetation, the physical conditions and the climate of Southern Africa we may quote Thunberg's drastic description of his experiences[13] during his stay at the Cape from 1772 to 1775:—

> "Per dunas arenosas, rivos infidissimos, Carro aridissimas, campos undulatos, littora falsa, colles lapidosos, alpes altas, praecipitia montium, fruteta spinosa sylvasque inconditas pericula vitae adii, feroces gentes et bruta prudenter elusi. Thule hujus australis gazas speciosas detegendi gratia laetus cucurri, sudavi et alsi."

The territory of the real Cape Flora forms a small strip of country in the extreme southwest and south of South Africa. The western limb measures from north to south about 250 and the southern one from west to east about 400 miles, both with an average width of fifty to sixty miles, the whole area representing about one-tenth of the country south of the Orange River; yet, the number of species of flowering plants found in it is equal to or even larger than that in the rest of that country.

As the systematic composition of the flora of the southwest has been discussed in detail in various publications, e.g., by Bolus, Marloth and Pole Evans, in the books listed in the references, there is no need to go into this question here, hence I shall discuss some other aspects of the subject, viz.:—

I. The historical development of our views on the delimitation of the region;

II. The geological evidence, as much or rather as little as there is available, concerning the origin of the southwestern flora; and

III. The causes, as far as we can attempt to trace them, that have brought about the present composition of the vegetation of this area.

The region of the Cape flora has been designated by later authors in various ways. Rehman (1880) and Engler (1882) applied the term "Southwestern region" to the country as far east as Mossel Bay. Drude (1887) used the term "Evergreen scrub region" for the same area, and Schimper (1898) termed it "Sclerophyllous Scrub Area." The first author to treat the whole area from the Bokkeveld in the northwest to Van Staden's mountains on the south coast as one province out of the five into which he divided South Africa was Bolus[3] (1886), who named it the southwestern region. Marloth[9] (1908) emphasised the contrast shown by the flora of this area when compared with the

remainder of South Africa by employing the term " The Cape Floral Kingdom." Pole Evans[10] (1920) calls it " the coast veld " and " the southwest veld," and in another publication (1922) the " Cape Region," while Bews[2] (1925) employs the term " southwestern region " and speaks of its vegetation as the " mountain and southwestern vegetation," suggesting the local term " Fijnbos " as a general designation.

## The Origin of the Vegetation of the Area.

There are, unfortunately, no fossil records of angiospermous plants available in South Africa, for the flora of the Uitenhage beds, the latest geological formation in which sufficient fossil remains of plants have been found, consists partly of ferns and other pteridophytes like its predecessors, and partly of cycadaceous and coniferous plants only, and belongs, as shown by Professor Seward,[12] to a transition period between the upper Jura and Cretaceous times. Our *Stangeria* and *Encephalartos* on the one hand and the genus *Podocarpus* or *Widdringtonia* on the other, are, therefore, the only genera of flowering plants of which we have fossil records of their ancestors. Hence we are compelled to base our theories concerning the vegetation generally on the present distribution of plants in the southern hemisphere, and that is, naturally, a very speculative undertaking, which could hardly be attempted here. In a rough way we might, however, arrange the floral elements of the south-western region in three groups, namely: (1) The old Cape element consisting of the descendants of a former much more widely distributed southern, perhaps partly antarctic, flora, of which remnants only have been cooped up, so to speak, in this small area, and thus turned the southwestern corner of the Cape into a living museum like some oceanic island such as St. Helena, but now, of course, invaded to a considerable extent by other elements; (2) elements identical with or related to the old African flora as predominating at the present time in the other parts of South Africa and Tropical Africa; (3) recent—that means post-tertiary —immigrants from the northern hemisphere.

This comprehensive subject cannot be adequately dealt with here. I can only mention a few examples by way of illustration. Beginning with the third group: Here we must reckon all representatives of northern genera, e.g., Anemone, Ranunculus, Corydalis, Lepidium, Sisymbrium, Trifolium, Rubus, Geum, Alchemilla, Carum, Pastinaca, Scabiosa, Hieracium, etc.

Examples of the second group would be the few species of Acanthaceae, Asclepiadaceae, Crassulaceae, Euphorbiaceae, the genus Mesembrianthemum in its comprehensive sense, and practically all the forest trees.

## The Old Cape Element.

The first section of the flora, the old Cape element, is very much larger than the other two together, for there are several hundred genera either exclusively or nearly exclusively found

here. The accompanying table contains the larger units, namely, families and tribes which are practically endemic.

| | Genera | Cape species | Species outside the Cape region |
|---|---|---|---|
| Proteaceae-Proteeae excl. *Faurea* and *Protea* ... ... ... | 11 | 204 | 5 |
| Bruniaceae ... ... ... | 12 | 55 | 1 |
| Rutaceae-Diosmeae ... ... | 10 | 180 | 12 |
| Grubbiaceae ... ... ... | 1 | 4 | — |
| Roridulaceae ... ... ... | 1 | 2 | — |
| Penaeaceae ... ... ... | 6 | 22 | — |
| Geissolomaceae ... ... ... | 1 | 1 | — |
| Ericaceae-Salaxideae ... ... | 17 | 138 | 1 |
| Verbenaceae-Stilbeae ... ... | 5 | 9 | — |

If we turn now to the question of the causes that have brought about this richness and comparative exclusiveness of our flora we have to distinguish two principal factors, namely, (1) the great diversity of topographical and physiographic features existing in this small area, and (2) the climatic conditions, past and present, which differ greatly from those of the other parts of South Africa, for they have produced what has been termed a " physiological isolation," that is, similar in its results to the physical isolation of oceanic islands.

It is usually assumed that the region of the Cape flora coincides with the winter rainfall area. That is, however, only to some extent the case, for winter rains extend much further east than the domain of the Cape flora, and prevailing winter rains occur only in its western section. If we take the rainfall for the four winter months, May to August, for a period of ten years (1885-1894), we find that the line which separates the districts with 50 per cent. or more of the annual total are recorded only in districts to the west of the meridian of Cape Agulhas, even Caledon being already on the boundary. On the other hand, a considerable stretch of country to the east of Algoa Bay receives as much rain in winter as some districts occupied by Cape flora.[b] [5]

Obviously, there are other climatic factors to be taken into account, such as the rainfall of the summer, the reliability of the rainfall, the relative humidity of the air, the prevalence of clouds on the mountains, the amount of sunshine and the distribution of the temperature, not only during the year, but also during the day. This leads to the fundamental facts governing these features, namely, the nature of the ocean currents surrounding South Africa, for we must remember that at present the south coast is washed by the comparatively warm Agulhas current and the west coast from the Cape of Good Hope northwards by the waters of the Antarctic drift.

That drift is obviously the main cause of the arid character of the western littoral and, consequently, the limiting factor for the Cape flora in that direction. It cannot have been always

so, but we have no evidence from the period in which the birth of the angiospermous flora of South Africa must have taken place—the Cretaceous period—and the origin of the Cape flora in particular remains wrapped in mystery.

At the end of the Cretaceous period the configuration of the country and the climatic conditions will have been more or less of the same nature as at present, but they did not remain stationary, as is sometimes asserted, for there have been changes undoubtedly, although not of the magnitude as envisaged by Passarge when speaking of a " pluvial period." As Dr. Rogers,[11] in his presidential address to the South African Association for the Advancement of Science in 1922, has reviewed the evidence available at that time as far as Post-Cretaceous times are concerned, I cannot do better than quote the summing up on this point:—

> " The conclusions these various lines of evidence point to are that during post-Cretaceous times the climate of South Africa has fluctuated within rather narrow limits; that there has not been a Pluvial period, if by that term is implied a long period of much greater rainfall over the whole country; that a general lowering of temperature in the Pleistocene may have given the Karoo and Southern Kalahari rivers longer periods of flow, but that this more humid era in those regions had come to an end long before human evidence can be drawn upon for an account of it; and that South Africa, like North Africa, the Americas and Australia, bears witness to a shifting of the climatic belts in Pleistocene and subsequent times."

The author does not specially refer to the south-western corner of the Cape, but his statements imply that this part of the country would have been affected in a similar way and that there must have been a corresponding expanding and shrinking of the area of the Cape flora.

Proofs for the occurrence of a change or changes in the direction of greater dryness are afforded by the present boundaries of the Cape flora, while some more facts indicating periods of greater rainfall in the drier parts of the country have been brought to light quite recently.

That at one time the Cape flora occupied a larger area than at present follows from the fact that there exist quite a number of isolated patches of such vegetation, of which the most important is that of the Kamiesbergen in Namaqualand, and that some of these out-stations contain species of typical Cape genera that are only related to, but not identical with species within the Cape area. One of the most conspicuous cases of this kind is *Cliffortia arborea* from the cliffs of the Roggeveld escarpment and the kloofs of the Hantam mountain, a species which in size and habit occupies quite an isolated position in the genus. There are a good many more such facts. How are these facts of distribution to be accounted for in any other way than by assuming that at some time or other, from causes that we do not know, an advancing steppe-climate annihilated the Cape types that formerly existed in the intervening spaces and perhaps far beyond, leaving these islands and cliffs of Cape plants as witnesses of a former condition of things.

As already stated, geologists have recently provided some additional observations that throw light on these questions. E. Kaiser[8] and W. Beetz,[1] in their great work on the southern Namib, that is the desert between the latitude of Angra Pequena and the Orange River, arrive at the conclusion that " a steppe-climate existed at the time of the upper eocene or lower miocene period," which period they term the " revier time," the word " revier " being used in its South African Dutch sense meaning a periodical river, and for which the term " subfluvial period " might be an equivalent. There are no such rivers south of the Swakop at present. Again (vol. II, 43):—

> " During the second section of this subfluvial period such an increase of precipitation must have taken place that the temporary rivers reached an enormous power of transport and erosion, until the climate assumed again a drier aspect and the valleys carved out by the rivers became filled with sand and débris."

It is obvious that if in mid-tertiary times the climate of the Namib 100 or 200 miles north of the Orange river was that of the present Little Namaqualand and the Hantam, or even richer in rain, the whole western part of the Cape at any rate must have had a much higher rainfall than at present, enabling the Cape plants to occupy vast tracts from which they are now excluded. How far this influence would have been felt in the east remains unknown. Similar observations on climatic changes to the north-west of the present domain of the Cape flora have been recently published by Dr. S. Haughton.[6] This author discusses the fact that the Molopo and other tributaries of the Orange further west exhibit features of rejuvenation impressed upon a mature stream, but that there is no permanent stream in the bed of the Molopo or these other rivers now. " The cessation of erosive action in south-west Gordonia must have been an event of geologically recent date." Possibly the change was connected with a change in the currents on the west coast of South Africa to which the same author[7] draws attention in his contribution to a paper by Drs. Wagner and Merensky on the diamond deposits on the coast of Namaqualand:—

> " The absence of this oyster, viz., *Ostrea prismatica*, in the living state, between Capetown and the Orange River and beyond, and the wide distribution of this species at the time of the formation of the highest terraces indicate changed current conditions, for *O. prismatica* lives at present still in the warm waters of the Durban coast, and we can only conclude that at the time of the formation of the highest deposits (of shells) near Port Nolloth, the warm Mozambique current washed the west coast reaching there across the sunken area of the Cape Flats."

This implies, of course, that a considerable portion of the sandy coast belt from Hopefield to Van Rynsdorp was then also under the waters of the sea which washed against the mountains of the Piquetberg range and further north against the Olifants-river range. How far the sea extended inland we do not know, but Dr. Haughton says of some gravel terraces near the mouth of the Buffelsriver occurring at a height of 210 feet above sea level " that they are almost certainly of marine origin."

There is consequently no question that at one time the climate of Namaqualand must have been warmer and moister and that, consequently, the climatic conditions favoured a less xerophytic flora than its present vegetation. This means that the Cape flora would have extended much further north, at least on the higher mountains, and that, for instance, the occurrence of *Restio Sieberi* on the mountains at Klipfontein, where the Port Nolloth railway crosses the escarpment at a height of 3,000 feet, is merely the last remnant of an outlier of Cape flora situated much further north than the present advance post on the Kamiesbergen.

## REFERENCES.


[1] BEETZ, W. See Kaiser.

[2] BEWS, J. W. "Plant forms." 1925.

[3] BOLUS, H. "Sketch of the Flora of South Africa." *Official handbook of the Cape of Good Hope.* 1886.

[4] BOLUS, H. "Sketch of the Floral Regions of South Africa." *Science in South Africa.* 1905.

[5] "Guide to Botanical Survey Work in the Union of South Africa." Pretoria, 1922.

[6] HAUGHTON, S. H. "Notes on the River-System of South-West Gordonia." *Trans. R. Soc. S. Afr.*, Vol. XIV, 1927, p. 225.

[7] HAUGHTON, S. H. Article in "The Diamond Deposits on the Coast of Little Namaqualand" by P. WAGNER and H. MERENSKY. *Trans. Geolog. Soc. S. Afr.*, XXXI, 1928.

[8] KAISER, E. "Die Diamanten Wüste Südwest Afrikas." Berlin, 1926.

[9] MARLOTH, R. "Das Kapland." Jena. 1908.

[10] POLE EVANS, I. B. "The Veld. Its Resources and Dangers." *S. Afr. Journ. Sci.*, XVII. 1920.

[11] ROGERS, A. W. "Post-Cretaceous Climates of South Africa." *S. Afr. Journ. Sci.*, XIX. 1922.

[12] SEWARD, A. C. "Fossil Floras of the Cape Colony." *Ann. S. Afr. Museum*, IV, 1903.

[13] THUNBERG, P. "Flora Capensis." Edition Schultes, Stuttgart, 1823.