

**CONTRIBUTIONS TO THE FLORA  
OF NORTH PATAGONIA AND THE  
ADJOINING TERRITORY; THE  
LINNEAN SOCIETY'S JOURNAL,  
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Contributions to the flora of north Patagonia and the adjoining territory; the Linnean Society's Journal, Botany, Vol. XXI; pp. 203-240 by John Ball

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W. G. FARLOW.

[*Extracted from the LINNEAN SOCIETY'S JOURNAL—BOTANY,*  
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BY  
JOHN BALL, F.R.S., M.R.I.A., F.L.S., ETC.



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Contributions to the Flora of North Patagonia and the adjoining  
Territory. By JOHN BALL, F.R.S., M.R.I.A., F.L.S., &c.

[Read February 21, 1864.]

I RETURNED last year from Brazil to England in company with M. Georges Claraz, a Swiss gentleman who had passed several years in the Argentine territory, chiefly at Bahia Blanca, and who during his residence at that place made frequent excursions through Northern Patagonia as far as the river Chubut, and even beyond that river. Having a fairly extensive knowledge of the principles of physics and biology, and being gifted with keen and accurate powers of observation, M. Claraz has accumulated a large store of valuable information respecting a region still very imperfectly known, which will, I trust, be soon given to the world. Along with collections in other branches of natural history, M. Claraz preserved specimens of most of the plants observed during his residence in South America. The greater part of these were sent some years ago to Switzerland, but have unfortunately been lost or mislaid. He retained a smaller collection, chiefly from the neighbourhood of Bahia Blanca and the adjoining territory of North Patagonia, which he was good enough to send to me after his return to Europe. It included about 190 species from the Patagonian region, and a much smaller set of about 60 species from the province of Entrerios. The interest of the collection is much enhanced by the notes added by M. Claraz respecting many of the species, their properties and uses, with the vernacular names of those familiar to the Indian tribes.

It is well known that the coast-region of North Patagonia was visited by Charles Darwin in 1833. He collected a good many plants, chiefly near Bahia Blanca, specimens of which are preserved in the Kew Herbarium, and has left an admirable description of the prominent physical characteristics of the Patagonian region. But neither Darwin nor any of the botanists who have since been able to visit the country have been able to penetrate far into the interior, or to remain long enough to acquire any but a very partial acquaintance with the flora. This is evidenced by the very meagre account of the vegetation given in Grisebach's great work on the Vegetation of the Earth, and by the fact that in the very useful volume on the Argentine Republic, edited by Mr. R. Napp, the late Professor Lorentz,

in the chapter treating of the Vegetation of the Argentine territory, was forced, when attempting to give an account of the Patagonian flora, to rely altogether upon information supplied by two settlers, M.M. Heusser and Claraz, who were not botanists, and were therefore unable to identify with species known to science most of the plants referred to by them under local names.

I have therefore thought it desirable to prepare a list of the species received from M. Claraz, as a contribution to the existing scanty materials towards a knowledge of the Patagonian flora, adding a few preliminary remarks on its general characteristics.

The political boundaries of Patagonia have been altered at various times; but we may safely assign as its natural physical limit to the north the valley of the Rio Colorado, which reaches the Atlantic about fifty miles south of Bahía Blanca. In his phyto-geographical map of the Argentine territory, Prof. Lorentz included a tract north of that river extending to the Sauce, whose estuary forms the port of Bahía Blanca; while for political purposes a considerable part of the country lying between the rivers Colorado and Negro has been annexed to the province of Buenos Ayres. Three considerable rivers carry the drainage of the Cordillera to the Atlantic across Patagonia, but receive only few and inconsiderable affluents—the Rio Colorado, forming the northern boundary, flowing S.E. and having its mouth about 40° S. lat.; the Rio Negro, uniting two considerable branches which between them drain the eastern face of the Araucanian Cordillera for a distance of fully 200 miles, and flowing E.S.E. into the Atlantic about 41° S.; and the Chubut, flowing a little S. of E. to its mouth about 43½° S. The Chubut may be looked upon as the boundary between North and South Patagonia, dividing it into two territories of nearly equal extent. Of these the northern has been partially, though imperfectly, explored; and annually receives a gradually increasing number of European colonists; while Southern Patagonia, in spite of the remarkable journey of Lieutenant Musters, continues to be one of the least-known portions of the earth, and, excluding the northern shores of the Magellan Strait which are subject to quite different physical conditions, contains in a territory as large as Spain but one petty trading-port—that of Santa Cruz, about lat. 50° S.; while the indigenous Indian population, estimated by Musters at 3000, is believed to be now reduced to less than half that number. Speaking in general terms, Patagonia may be said to consist of

a plateau region extending from the base of the Cordillera to the Atlantic coast, the whole of which has been upraised within a very recent geological period, and in which the rivers and minor streams have excavated valleys varying much in depth and breadth. The most remarkable feature in the flora of this region is its extreme poverty. Its components include the plants growing on the dry stony plateaux and those of the comparatively moist and sheltered valleys; but, putting together all that has been collected and published in Europe, I doubt whether more than 300 indigenous species can be said to be certainly known to grow south of the Río Colorado. No doubt this number will be largely increased whenever naturalists are able to reach the country at the eastern base of the Cordillera, where Lt. Musters observed many plants not seen by him elsewhere. With regard, however, to the region now comparatively known, it is certain that the extreme poverty of the flora of such an extensive continental area is a fact quite exceptional. If this be true as to North Patagonia, the case is much stronger as to the southern part of the territory. In the neighbourhood of Santa Cruz Dr. C. Berg was able to collect only 60 species, including in that number a few Cryptogams; and he notes the rarity of grasses in that district, while in M. Claraz's collection I find 24 species of indigenous grasses, besides 6 others, probably introduced by man.

The causes of the poverty of the Patagonian flora do not seem to me to have been adequately explained. Prof. Lorentz\* is disposed to attach most importance to the uniformity and sterility of the soil and the rudeness of the climate. The soil of the plateau is no doubt both very uniform and very sterile, but similar tracts in other parts of the world support a very varied vegetation, and Engler has assigned good reasons for believing that dry soils are in general favourable to the development of new vegetable forms. Further, it may be remarked that the soil of the valleys must exhibit a sufficient degree of variety of moisture, of constituents, and of exposition to favour the development of many species not yet established there.

Still less can I admit the severity of the climate as an explanation of the poverty of the flora. So far as I know, we have no continuous observations from any place in Patagonia proper; but we cannot suppose the climate of the northern districts to

\* See 'The Argentine Republic,' by Richard Napp (Buenos Ayres, 1876), Chapter vii. by the late Prof. Lorentz.



differ much from that of Bahia Blanca, where we find the following temperatures as the result of 20 years' observations :—

Three summer months .....	75·6 Fahr.
Three winter months .....	46·2 „
Mean of the year .....	59·4 „

This at once shows that the climate is eminently of a temperate character; and this conclusion is fortified by the fact that in 20 years the mean maximum temperature of the year was 100°·7 F.\* and the mean minimum 26°·8 F. A very similar climate is to be found in Europe in the corresponding latitude about 100 miles east from the coast of Portugal towards the Spanish frontier. If further proof were requisite, it is to be found in the fact that wheat is very productive, and the vine thrives in the valley of the Rio Negro. As already remarked, the dryness of the climate does not account for the poverty of the flora. As is well known, the opposite coasts of extratropical South America present exactly opposite conditions as regards the distribution of moisture. In travelling southwards on the west coast you pass from the rainless zone of Peru and the extreme dryness of Northern Chili to the climate of Central Chili, where at Valparaiso the annual rainfall is only 18·6 inches, yet supports a varied flora, including a good many indigenous trees whose structure has been adapted to the climatic conditions. The rainfall increases very rapidly along the southern coast of Chili till it reaches a maximum, probably about 42° S. lat., of from 130 to 140 inches a year.

On the Atlantic coast you find in South Brazil, about 26° S. lat., an annual rainfall of about 90 inches, which at Monte Video is already reduced to about one half, and at Buenos Ayres, less exposed to the direct influence of the Atlantic, is not more than 35 inches. But this, it will be remarked, is nearly three times the fall at Valparaiso, in the same latitude, on the west coast. At the hilly station of Tandil, not far from the sea, though further south by three degrees, the rainfall is the same as at Buenos Ayres; but at Bahia Blanca we find only a fraction less than 20 inches, and Dr. Hann gives a return for one year from the banks of the Chubut showing a rainfall of 17 inches. There

\* The comparatively high maximum temperature given for Bahia Blanca may depend on local causes or some defect in the protection of the thermometer from radiation. At Buenos Ayres, more than 4° nearer the equator, the mean yearly maximum is 94° F.

is a further point to be noted—that on the west coast the rainfall is almost exclusively confined to winter, whereas in Patagonia it is spread pretty uniformly over the seven warmer months of the year from October to April, not more than five inches falling in the five colder months, from May to September, a condition evidently favourable to tree-vegetation.

The true explanation, in my opinion, of the exceptional poverty of the Patagonian flora is to be sought in the direction long ago indicated by Charles Darwin, when, in discussing the absence of tree-vegetation from the pampas, he remarks that in that region, recently raised from the sea, trees are absent, not because they cannot grow and thrive, but because the only country from which they could have been derived—tropical and subtropical South America—could not supply species organized to suit the soil and climate. So it happened in Patagonia—raised from the sea during the latest geological period, and bounded to the west by a great mountain-range mainly clothed with an Alpine flora requiring the protection of snow in winter, and to the north by a warm temperate region whose flora is mainly of modified subtropical origin—the only plants that could occupy the newly formed region were the comparatively few species which, though developed under very different conditions, were sufficiently tolerant of change to adapt themselves to the new environment. The flora is poor, not because the land cannot support a richer one, but because the only regions from which a large population could be derived are inhabited by races unfit for emigration. The rapidity with which many introduced species have spread in this part of South America is perhaps to be accounted for less by any special fitness of the immigrant species, than by the fact that the ground is to a great extent unoccupied. Doubtless, if no such interference had taken place, and the operation were left to the slow action of natural causes, a gradual increase in the vegetable population would come about. Fresh species of Andean plants would gradually become modified to suit the climate of the plain (perhaps one such recent instance is supplied in *Boopis laciniata* of the following list); still more slowly new varieties would have been developed among the indigenous plants, from which, by natural selection, new species would have been formed. No doubt these causes have been in action during the short time that has elapsed since Patagonia has existed as part of the continent; but the time has been far

too short to allow of the development of a rich and varied flora. We are apt, I think, to underrate the extreme slowness of the operation of the agencies that modify the forms of vegetation and the fact that change in arboreal vegetation must, other things being the same, proceed much more slowly than with herbaceous, especially annual, plants. How many of the plants found in fossil Miocene deposits, enormously more ancient than the commencement of the Patagonian flora, are more than slightly modified forms of existing species?

Although the collection at my disposal gives a very incomplete view of the flora of North Patagonia, there may be a little interest in comparing the proportion borne by the chief natural orders to the whole known flora in this as compared with the flora of the Argentine region as made known by Grisebach's 'Symbols.'

*Table showing the Proportional Number of Species belonging to the chief Natural Orders in the North-Patagonian and Argentine Floras.*

Natural Orders.	North Patagonia.		Argentine.	
	No. of species.	Percent. on whole flora.	No. of species.	Percent. on whole flora.
Cruciferae .....	4	2.0	21	0.9
Caryophyllea .....	3	1.5	30	1.35
Malvaceae .....	0	0	51	2.25
Geraniaceae .....	5	2.6	31	1.4
Leguminosae .....	8	4.1	174	7.7
Bonaceae .....	7	3.6	14	0.6
Lythraceae .....	1	0.5	25	1.1
Loasaceae .....	4	2.0	11	0.5
Umbelliferae .....	4	2.0	38	1.7
Rubiaceae .....	1	0.5	39	1.7
Compositae .....	36	18.65	377	16.3
Asclepiadaceae .....	1	0.5	38	1.7
Convolvulaceae .....	0	0	44	1.9
Solanaceae .....	9	4.6	95	4.2
Scrophulariaceae .....	5	2.6	33	1.5
Labiatae .....	1	0.5	33	1.5
Verbenaceae .....	7	3.6	49	1.9
Amarantaceae .....	7	3.6	37	1.65
Chenopodiaceae .....	8	4.1	19	0.84
Polygonaceae .....	5	2.6	19	0.84
Euphorbiaceae .....	0	0	76	3.4
Urticaceae .....	1	0.5	22	1.0
Iridaceae .....	2	1.0	22	1.0
Liliaceae .....	1	0.5	26	1.15
Cyperaceae .....	5	2.6	66	2.9
Gramineae .....	30	15.5	187	8.25
Filices .....	6	3.1	66	2.9