

GEOGRAPHICAL FEATURES OF THE FLORA OF THE BAILADILA RANGE IN BASTAR STATE, C.P.

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BAILADILA RANGE AND THE AFFINITIES OF ITS FLORA.

While discussing the Satpura Hypothesis of the distribution of animals of Malayan affinities with Peninsular India, Mr. Salim Ali kindly directed my attention to Mooney's (1942) article entitled 'A Sketch of the Flora of the Bailadila Range in Bastar State'. It is a remarkable article for a study of the plant geography of the area and Mooney has attempted to explain his facts by advancing several hypotheses, which deserve careful consideration.

Bailadila lies between $18^{\circ} 30'$ and $19^{\circ} 5'$ north and $81^{\circ} 10'$ and $81^{\circ} 15'$ east and extends for some 45 miles south of the Indravati; both geographically and geologically it forms a separate unit. It rises sharply on all its aspects and reaches a height of over 3,000 feet for much of its length. Several peaks exceed 4,000 feet, the highest being 4,185. Though Bailadila lies more than a hundred miles west of the main chain of the Eastern Ghats, some of the intervening country consists of wooded hills running up to 3,000 feet, thus providing an avenue for the exchange of animal and plant life. Apart from this scanty connection, Bailadila is very isolated, the next high range of hills to the north being the Satpuras, over 300 miles distant, while to the west and south there are no mountains of comparable size until the Western Ghats and the Nilgiri Hills, well over 500 miles away, are reached.

From the standpoint of plant geography, Mooney has divided the total assemblage of plants into the following categories:—

- (i) Plants having a northerly or north-easterly affinity.
- (ii) Plants with an easterly affinity.
- (iii) Plants with a southerly or nearly southerly distribution.
- (iv) Plants with a westerly affinity.

From an analysis of the distribution lists, Mooney has concluded that 'thirty-six species have a definitely northerly or north-easterly affinity; while thirty plants are South Indian. Besides, two species belong to the Western Peninsula and two derive their origin from easterly sources, namely, from Burma and the Eastern Ghats.'

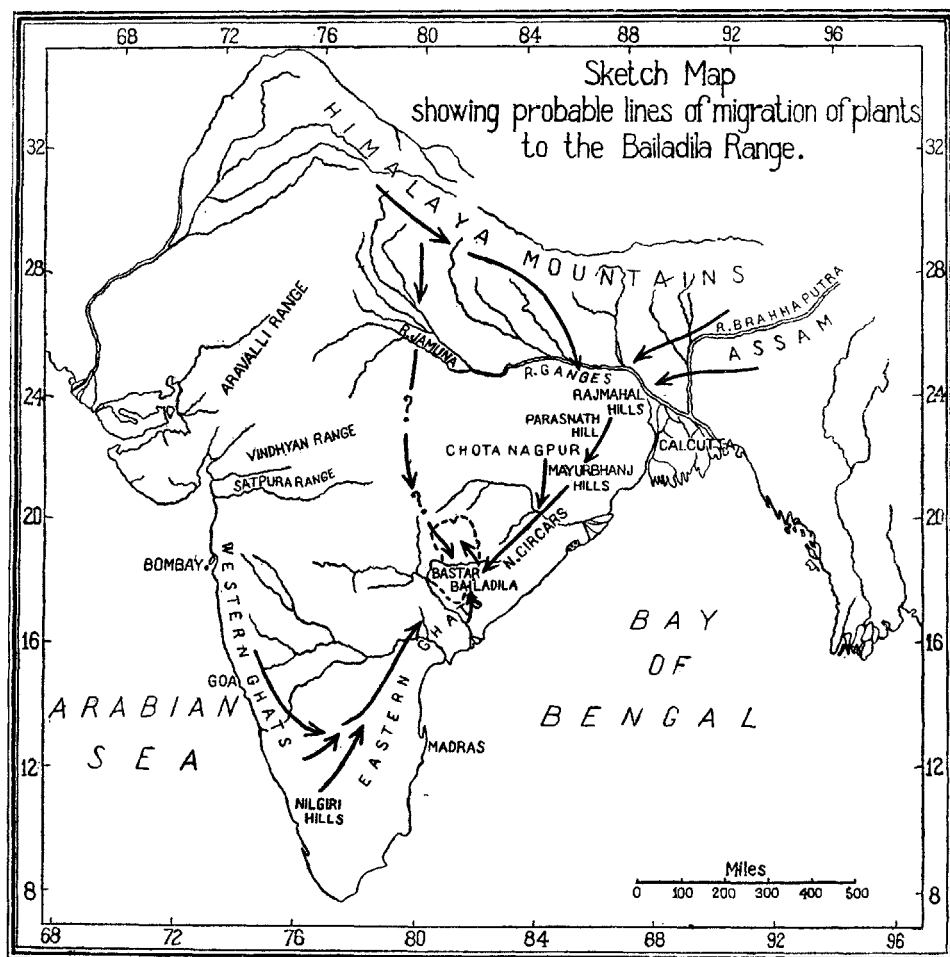
MOONEY'S VIEWS REGARDING THE PROBABLE ORIGIN OF THE BAILADILA FLORA.

Mooney has characterized the north-easterly influence interesting and stated that 'Its strength would seem to derive from the easy line of migration provided by the Rajmahal Hills, the highlands of Chota Nagpur, the mountains of Orissa and the hills of the Eastern Ghats, which terminate only some 100 miles or so east of Bailadila, and by the hills intervening between the Eastern Ghats and our area'. Thus he found this chain fairly continuous from Chota Nagpur southwards, and stated 'it is not a far cry from the Rajmahal Hills to the Bengal Duars and the hills of Sikkim and Assam. This provides a route by which plants could have migrated from Burma'. Though the present-day topographical and climatic conditions are not favourable for the plants and animals of the Assam Hills and the Eastern Himalayas to migrate to the Chota Nagpur Hills over the Rajmahal Hills, the Satpura Hypothesis of the writer postulates the existence of such favourable conditions over the intervening areas in the Pliocene and Pleistocene periods.

It may here be noted that, according to Mooney, it is not easy to explain how *Strobilanthes Falconeri* and *S. rufescens* reached Bailadila from Tenasserim and Pegu.

For the occurrence of the South Indian plants in the Bailadila Range, Mooney has postulated a hill-route and a river-route. As regards the hill-route he has stated:

'It does not call for great powers of imagination to visualize how species having their origin in the Nilgiris, Pulneys (*sic*), and other hills of Mysore, Travancore and Southern India may have travelled northwards along the line of the Eastern Ghats until they reached the northern extremity in the Kasipur plateau of Kalahandi State and the Agency Tracts of Ganjam and Vizagapatam districts with their humid coastal climate and many hills exceeding 4,000 feet in altitude. The distance from the southern plateau of Kalahandi to Bailadila in a straight line is not more than 120 miles; but Tulsī Dungri, itself 3,914 feet, situated about 50 miles east of Bailadila and other intermediate hill ranges of lesser calibre shorten the gap. Thus, the distance separating the northern end of the Eastern Ghats from our area is not much as to present any serious obstacle to transport by birds, animals or, in case of the lighter seed, by wind.'



As regards the river-route of dispersal of plants, Mooney has stated:

'The Indravati river provides a further route by which fruits and seeds may have been carried from the Kalahandi plateau to Bailadila. This river has its source in Thuamul-Rampur *zamindari* near Kasipur at a height of 3,100 feet and, after flowing through the

Jeypore Estate of Orissa, finds its way into Bastar and passes close to the northern extremity of the Bailadila range. Thus the connection between Bailadila and Southern India is fairly complete and the stretches of low ground are not such as to present a serious impediment to the dispersal of seed of the more readily transported and easily disseminated varieties of plants; and, given more favourable climatic and possibly physiographic conditions than those at present obtaining, the transit of plants would have been greatly facilitated.'

Mooney expressed great difficulty in explaining the dispersal of plants with northern and north-westerly affinity to Bailadila, but in dealing with the migration of high-level species from the Central Himalayas, most of which extending to the Eastern Himalayas, he thought that they followed the same route as the plants of the Assam Hills and the Bengal Duars. His map showing probable lines of migration of plants to the Bailadila Range summarizes his views on plants dispersal in an admirable way and this may be borne in mind for following the discussions.

PROBABLE AGE OF THE BAILADILA FLORA.

From a study of Mooney's paper, it appears that the endemic flora is almost insignificant. He found three new species belonging to the genera *Gymnosporia*, *Pygeum* and *Fimbristylis*. Only the first is named as *G. bailadilana* Narayanswami and Mooney, and is stated to approximate *G. Falconeri*. The other two species are not named in it, but regarding the new species of *Pygeum* it is stated that it is 'very like *P. Andersoni* Hook. f. in appearance, but differs in the glabrous petals and the larger number of stamens' (p. 223). *P. Andersoni* is listed by Mooney as occurring in the Bailadila Range and having northerly or north-easterly affinity. Regarding the Bailadila specimens referred by him to this species, he has observed (p. 225):

'If the identification is correct, this considerably extends the range of this rare species. It may, however, turn out to be an endemic species.'

Pygeum Andersoni has hitherto been known from Parasnath, Surguja and Mahendragiri.

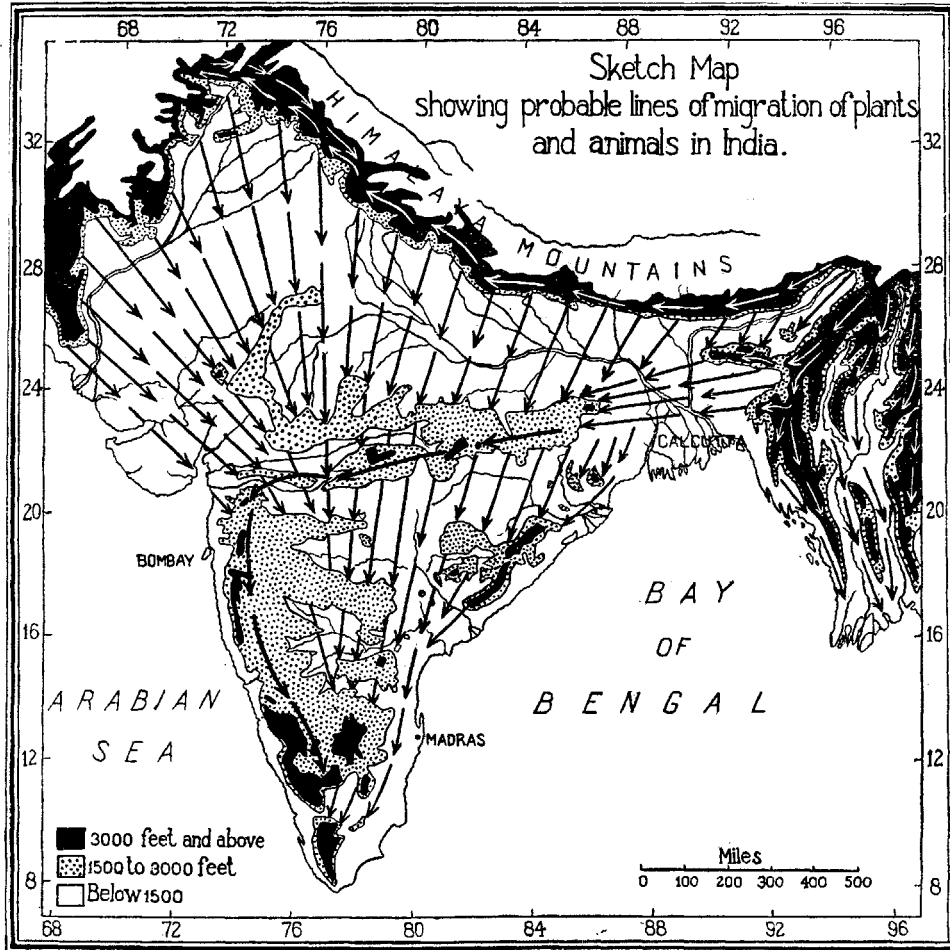
It will thus be seen that, since the isolation of the Bailadila flora, speciation has hardly proceeded even *One Species Step*. *Pygeum Andersoni* seems to be becoming polytypic in the Bailadila Range where two new forms can be differentiated from the *forma typica*. Even the new species of *Gymnosporia* approximates *G. Falconeri*. It will be of considerable interest if some botanist were to study in detail the intraspecific systematics of the Bailadila flora with a view to find out minor racial differentiations that may have occurred from the parent stock as a result of isolation.

From the above discussion, it is pertinent to infer that the special flora of the Bailadila Range migrated there during the Pleistocene, not more than a million years ago. I leave it for the botanist to dispute this view on the basis of speciation in the genera enumerated above.

PROBABLE ORIGIN OF THE BAILADILA FLORA.

Taking into consideration the probable age of the Bailadila flora as indicated above, it seems that dispersal must have taken place during the 'Pluvial Periods' when, as a result of glaciation in the Northern Hemisphere, the climates all over India were damper and more humid. Such favourable conditions for the dispersal of plants and terrestrial animals must have been more marked along hill ranges and must have lasted longer at higher altitudes, for they persist even today on the tops of isolated hills in Central and Southern India, and in humid situations along the Western and Eastern Ghats. As there is almost a continuous hill range from the Western Ghats to the Assam hills in the Vindhya-Satpura Trend of mountains, it

must have formed the most favourable route for the dispersal of both plants and terrestrial animals during these periods, and then along the almost continuous Western Ghats to Ceylon. Except at higher altitudes and in other suitable places, the moisture-loving flora and fauna must have died out during the 'Arid Periods' alternating with the 'Pluvial Periods'. As there were three Glacial Periods during the Pleistocene, the present-day flora of the Bailadila Range may be taken as the accumulative result of three distinct invasions and this would explain some of the anomalies in the distribution of plants and animals.



It seems to me unlikely that the flora of the Western Ghats and the Nilgiris could migrate north-eastwards to reach the Bailadila Range. Similarity in their flora could be accounted for on the assumption that this flora migrated from the north over a wide area under suitable conditions and now lies isolated in favourable situations, having died out from areas where the conditions became unfavourable for its existence. This applies equally to the faunas and floras of the Chota Nagpur and Satpura hills and those of the Aravalli range. In the accompanying map, I have indicated by arrows the probable routes of migration of plants and animals during the pluvial periods and it will be seen therefrom that the fauna and flora of Peninsular India possess all the three elements, north-easterly, middle

Himalayan and north-westerly. The north-easterly element is the most predominant owing to the continuity of mountain ranges and the consequent climatic factors characteristic of the Satpura Hypothesis.

REFERENCE.

Mooney, H. F. (1942). A Sketch of the Flora of the Bailadila Range in Bastar State. *Ind. Forest Rec. (N.S.), Botany*, 3, 197-253.

ADDENDUM.

When the above was in proof, the *Statesman* of December 4, 1949, reported the discovery of several plants of Malayan affinities in Madras. This item of news is reproduced below in full as it is relevant to the subject-matter of the Symposium and lends additional support to the views advanced in this article.

Discovery of Medicinal Plant in Madras.

NEW DELHI, Dec. 3.—A medicinal plant which is a reputed specific for black-water fever, has been discovered in the Rampa Agency tracts of Madras province as the result of botanical investigations undertaken by the Botanical Survey of India.

This plant, called *Vitax Peduncularis* Var. *Roxburghiana*, was formerly known to exist only in Assam. Examination of other collections brought from Rampa Agency has also revealed the existence of a number of plants originally growing in distant regions like the Himalayas, Assam, Burma and the Andaman Islands.—PTI.