A STUDY OF VEGETATION IN ISLA SANTA CRUZ, GALAPAGOS ISLANDS

by

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My stay in the Galapagos Islands was from February to June, 1970. The purpose was to continue field works of vegetation studies from the standpoints of plant ecology and phytosociology, which started in the 1964 Galapagos International Scientific Project. My concerns in the fields are centered on (1) the vegetation-habitat relationships, (2) the floristic composition and structure of plant communities, (3) the distribution of endemic species in relation to habitats and communities, (4) secondary communities replacing natural ones under human impacts such as cutting, trampling, grazing, etc. and (5) mapping of the natural and secondary communities (Itow, 1965; 1966). The present paper deals with part of the studies made on Isla Santa Cruz concerning (1), (4) and (5).

Highland Topography and Vegetation

Up to now, any topographic maps of Santa Cruz have not yet been pubished. This is a great difficulty in studying the vegetation-habitat relationships and in mapping the vegetation. The field works, therefore, had to be made of the topography as well as of the vegetation itself. The map attached in this paper is a result of my surveys in the highland with the aid of a hand compass and an altimeter. Mt. Crocker is the highest peak of the island and it attains to an altitude of 860 m above sea level, based on the altimeter reading.

Many craters of the cinder cones scattered in the highland are broken or low at their southeast rims. This may be because the ejecta from the craters were driven by the southeasterly trade wind and accumulated on the leeward side, when they are active in the past.

As the trade wind blows up along the southern island slope, the air moisture is condensed into fog, mist and drizzle that envelop the highland area (Alpert, 1946). This is the prime reason of a moist condition and much rainfalls in the highland. (In 1969 that was a rainy year, the rainfall amount is more than 2600 m at an altitude of 620 m, while 470 mm at the Charles Darwin Research Station. Data from the highland by courtesy of Messrs. T. de Vries and D. Weber of CDRS). The fog and drizzle, however, are usually restricted to the southern side of the main ridge and not reach the leeward side (Alpert, 1946). Such a "rain shadow effect" seems to have a direct and indirect influence upon the plant distribution in the high-

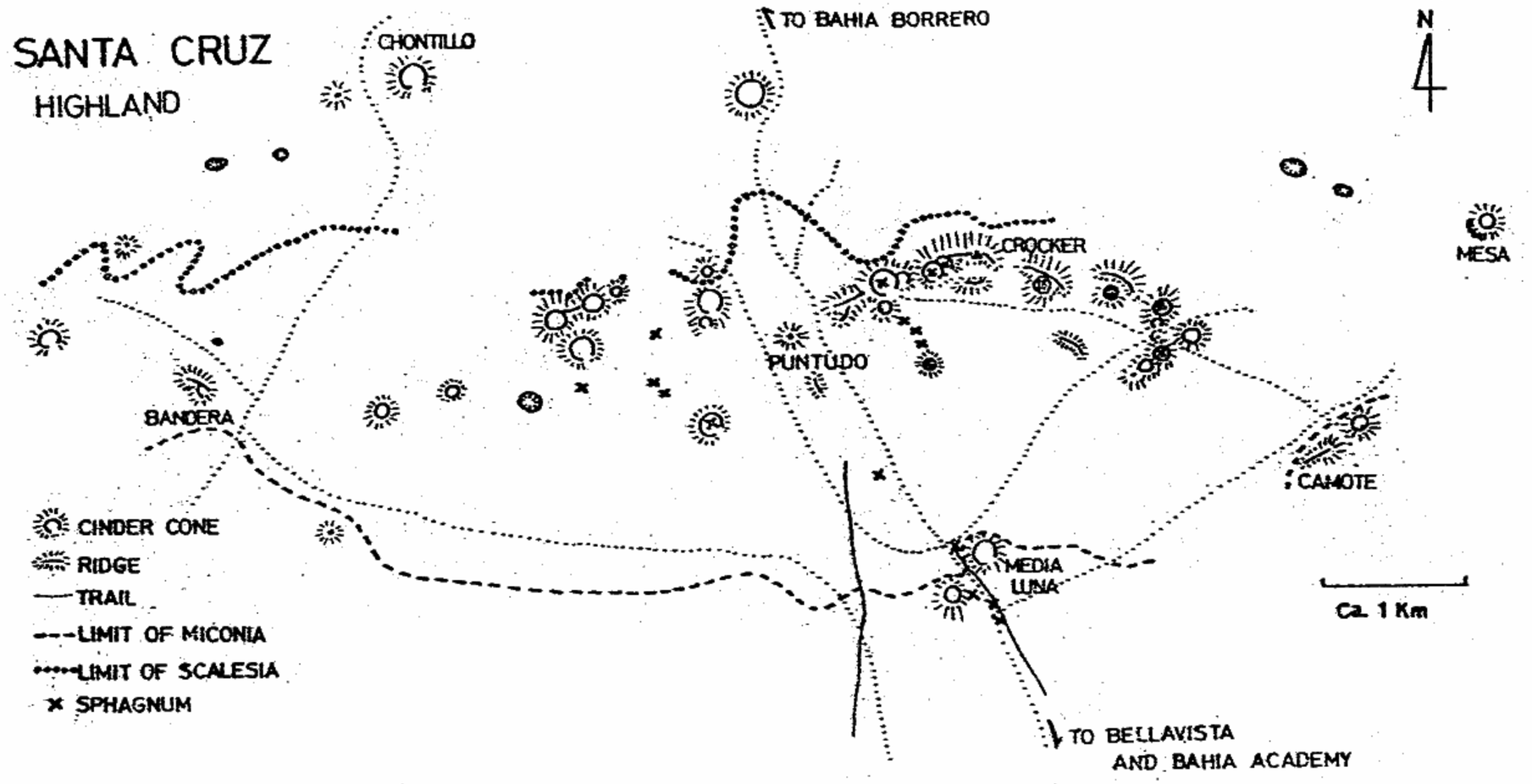
land, which is briefly given below.

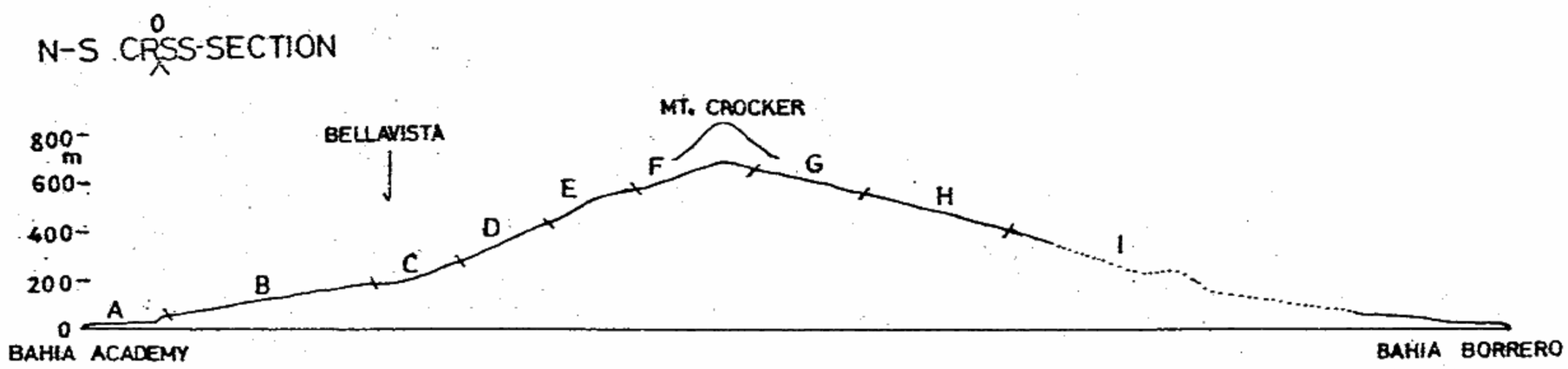
As for the vegetation, the attached map shows only the upper limit of the Miconia belt on the southern side, that of the Scalesia forest zone on the northern side and the distribution of Sphagnum bogs. The area between the Miconia belt and the Scalesia forest zone is the so-called grassland zone dominated by bracken (Pteridium aquilinum var. arachnoideum). Since it is said that fires have burnt the highland area, the upper limit of the Miconia belt in the past was probably higher than in the present time. Actually, patches of living and dead colonies of Miconia robinsoniana are found in lower parts of the grassland zone. On the northern side of the main ridge, no plants of this species are seen.

The grassland vegetation also may have been deformed by the repeated fires, but originally there was a treeless vegetation. This is apparent from the description of the first ascent to the highest peak (Mt. Crocker) made by the 1932 Templeton Crocker Expedition from the California Academy of Sciences (Howell, 1942) and from the photographs taken at that time (Howell, 1957 : see Plates 2b, 3a and 3b in Leafl. West. Bot., Vol. 8, N°8). (By courtesy of Dr. J.T. Howell, California Academy of Sciences, I was given a chance of access to original copies of those photographs and further his field notes made at his first ascent to Mt. Crocker. They are greatly critical to see the original highland vegetation.)

Sphagnum bogs are scattered in the grassland zone. They are especially abundant just south of the Mt. Crocker ridge, while rare in western part of the highland. Several Sphagnum patches are found on nearly vertical cliffs in the crater group situated between Mt. Crocker and El Camote. The cliffs are facing southeast. Apparently, the Sphagnum patches are supported by waters from fog and mist carried by the trade wind. Pernettya howellii, the only species of the Ericaceae endemic to the Islands, is distributed abundantly on steep slopes facing southeast around Mt. Crocker. The habitat is strongly affected by the trade wind and its bringing fog and drizzle. (The distribution of this species is not given in the map.)

On the northern side of the main ridge, Miconia robinsoniana is not distributed and the grassland is directly contiguous to the Scalesia forest. If a plant species indicates an environmental condition, it is safe to say that the Scalesia forests just north of the ridge are ecologically equivalent to those in altitudes between 180 m and 280 m on the southern island slope and that the distribution of the forest in the leeward side results from the rain shadow effect mentioned before. The rain shadow effect may be seen in the fact that the upper limit of the Scalesia forest is higher on the north side of high hills than on the same side of low ridges. (See two hills just east and west of Cerro Puntudo.)


SANTA CRUZ
HIGHLAND
CHONTILLO
TO BAHIA BORRERO
N
4
CROCKER
MESA
PUNTUDO
BANDERA
CAMOTE
MEDIA LUNA
Ca. 1 Km
CINDER CONE
RIDGE
TRAIL
LIMIT OF MICONIA
LIMIT OF SCALESIA
SPHAGNUM
TO BELLAVISTA
AND BAHIA ACADEMY


N-S CROSS-SECTION
MT. CROCKER
BELLAVISTA
800 m
600
400
200
0
A
B
C
D
E
F
G
H
I
BAHIA ACADEMY
BAHIA BORRERO

South - North Transect of Santa Cruz

A survey of the vegetation zonation was made along the trail from Bahia Academy via Bellavista up to the pass between Mt. Crocker and Cerro Puntudo and further down to an altitude of 350 m on the northern island slope. Another reconnaissance was made from Bahia Borrero at the north shore inland to an altitude of 80 m. Although there is an unexplored region between those altitudes on the northern side, the outline of the zonation was obtained on both slopes, as given in the figure below the map. The zones and belts recognized are as follows.

	South side	North side
Dry Zone (Bursera forests mixed with Opuntia or without)	A (0- 40m)	I (0-430m)
Transition Zone (Pisonia/Psidium forests, mixed with Bursera; epiphytic lichens is prominent)	B (40-180m)	II (430-560m)
Scalesia forest Zone	C (180-280m)	G (560-670m)
Brown Zone	D (280-420m)	absent
Miconia Belt	E (420-580m)	absent
Grassland Zone	F (580-860m)	(670-860m)

The vegetation zones mentioned here were determined primarily by the physiognomy of the prevailing natural vegetation, and within a zone there are various plant communities that are defined on the basis of floristic composition. For example, the Sphagnum bog, the Pernettya howellii-dominated community, the Pspalum conjugatum-dominated community and the bracken community are found side by side in the grassland zone. The same is true of the other vegetation zones.

Secondary Vegetation

It is important to record plant communities on man-made or man-disturbed habitats for studying the invasion and expansion of exotic species that are introduced accidentally or intentionlly. Several secondary communities on such habitats were seen in the Galapagos. Cynodon dactylon, a species of Gramineae, predominates only in heavily trampled habitats of the Scalesia forest zone in Isla Santa Cruz and Isabela,

being accompanied by some ruderal weeds such as Eleusine indica, Plantago major, Sporobolus indicus. Around El Junco and San Joaquin in San Cristobal, Echinochloa colonum covers an extensive area under heavy grazing, where the original vegetation ~~is~~ was apparently made up of Miconia robinsoniana and Psychotria rufipes. Both communities cited above are only examples of the secondary communities seen in the Islands.

References

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