The Mexican tropical deciduous forest of Baja California Sur: a floristic and structural approach

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Abstract

A quantitative study is presented of the tropical deciduous forest located in the Sierra de La Laguna in the southern part of the peninsula of Baja California, Mexico with data on structure, species composition, diversity, density, and abundance of perennial plants.

4 study plots were selected to represent the predominant geomorphologic units, and to include topographic and climatic variations reflected by the distribution of this vegetation on the lowlands of slopes facing the Gulf of California and the Pacific Ocean.

25 families containing 67 perennial species were found on the lowlands, with Leguminosae, Cactaceae, and Euphorbiaceae best represented. A high family diversity was found in the plots, but there was a low number of species per family. Dissimilarities between sites were found to be reflected significantly in growth-form abundances as well as in structural features and species diversity. Results show that the xeric environment, the low number of species, and the high incidence of dominant shrub species confer the vegetation of the lowlands simpler structural traits than those described for other tropical dry forests.

Nomenclature: Wiggins, I.L. 1980. Flora of Baja California, Stanford. Species were identified in situ and by consulting herbarium collections at different institutions particularly those of Centro de Investigaciones Biológicas (CIB), Escuela Nacional de Ciencias Biológicas of the Instituto Politécnico Nacional, and Instituto de Biología of the Universidad Nacional Autónoma in Mexico, and the University of California in USA. Most of the collected voucher specimens are kept at CIB.

Introduction

The tropical deciduous forests of arid and semi-arid regions of Mexico are very diverse and rich in endemic species (Johnston 1940; Rzedowski 1963; Rzedowski 1973, 1979; Gentry 1982a). Some studies have used a floristic approach to characterize these forests (Shreve 1937; Miranda & Hernández X. 1989). However, few attempts have been made to describe them quantitatively (Lott et al., 1987), even though they represent the most distinctive vegetation type of Mexico.

In geographic distribution this vegetation type occurs typically along the Pacific slope of Mexico, although it also occurs in patches along the Gulf of Mexico. It covers approximately 10% of the
territory of Mexico (Rzedowski 1978, 1979). In Baja California Sur, few studies have attempted to describe the species composition of the tropical deciduous forest (Shreve 1937; Johnson 1958; Villa-Salas 1968; Wiggins 1960, 1980; León & Dominguez in press) and none to date have considered a quantitative approach to structural community characteristics. The principal aim of this work is to provide a structural-compositional description of the tropical deciduous forest of the Sierra de La Laguna.

Study site

The study site is in the proposed Biosphere Reserve ‘Sierra de La Laguna’ situated in the southern part of the Peninsula of Baja California (22° 50’–24° N and 109° 60’–110° 10’ W). The Sierra is composed mainly of Cretaceous granites, which reaches elevation of 2200 m. Soils are lithosols or regosols with a sandy texture. They are rocky, shallow, and with low organic matter content. The distribution of the tropical deciduous forest ranges from 300 to 800 m above sea level covering 170 500 ha (Villa-Salas 1968). It grows on three of the major landforms which constitute the Sierra: plateaux, hills, and mountains (Hammond 1954) but this study will only deal with the lowlands, where plateaux and hills are the predominant landforms. The plateaux are apparently transition zones between the sarcocalescent scrub and the tropical deciduous forest. The lowlands of the Sierra have been grazed for two and a half centuries, so they present man-induced disturbances.

The tropical deciduous forest extends along the slopes facing the Gulf of California and the Pacific Ocean. These slopes present topographic and climatic differences. The most striking topographic dissimilarities are due to the steep slopes found on the western side of the Sierra. Gulf slopes, on the eastern side of the peninsula, are more gradual. Climatic differences are also remarkable. Although both slopes have a semiarid climate with a long and pronounced dry season (late October-July), there are differences in total precipitation between slopes. According to the Santa Gertrudis (20 yr) and the Santiago (22 yr) meteorological stations (García 1981), the Pacific slope receives a greater amount of rainfall (507 mm) and is colder (mean monthly temperature 22.4 °C) than the Gulf slope, with 303 mm and 23.5 °C.

Methods

As part of a broader study of the tropical deciduous forest, four plots were chosen in the lowlands of the Sierra de La Laguna. The first two plots were delimited on plateaux covering an area of 1000 m² each: 1) facing the Gulf of California (Gulf Plateau) at 295 m a.s.l., 2) facing the Pacific Ocean (Pacific Plateau) at 320 m a.s.l. The other two study sites were on hills: 3) located at 335 m a.s.l. on the Gulf slope (Gulf Hill) covering 1200 m², and 4) located at 460 m a.s.l. on the Pacific slope (Pacific Hill) covering 800 m². Plots were selected to cover the range of predominant landforms and varying slope exposure within the lowlands of the Sierra, although this range is not meant to include all the variation in the Sierra. Permanent quadrats were established at each study site and their size delimited according to a species–area curve.

The floristic and structural data refer to all perennials in the plots: species abundance, individual height, crown cover, and growth form. All records were obtained during late May to July, so results are restricted to the dry season. We also measured crown cover as an estimate of dominance because, in this forest community, tree species frequently produce very large crowns with diameters equal to or greater than their height. Crown cover was calculated according to the formula of an ellipse: 

\[ C = \pi \cdot 0.25 \cdot D_1 \cdot D_2 \]

where \( D_1 \) is the largest crown diameter and \( D_2 \), the diameter perpendicular to \( D_1 \). Six growth forms were defined: perennial herbs, woody vines, globose succulents, columnar succulents, shrubs, and trees.

Growth form spectra were analyzed using a chi-square test of independence and by examining