Dynamics of plant communities in the Lomas of southern Peru

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Abstract

A study of the floristic composition of the plant communities of the Lomas was carried out in the Coastal Range of Arequipa, Peru. Data on the seasonal and elevational variation of those communities was obtained by monthly censusing a 20-meter circle sampling stations established at 100 m intervals from 300 to 1,000 m of elevation. The 80 recorded plants belong to 60 genera and to 20 families. Dominating life forms are Therophytes and Chamaephytes. Four vegetational zones (xeric, subxeric, mesic, and submesic), are separated by significant differences in the number of plants of each zone. Considering the entire Lomas transect, no significant statistical differences among the seasons were found. The floristic relationship among the altitudinal samples was found to be a reflection of a moisture pattern. The persistence in the Lomas of a mesophytic flora could be the result of a continuous adaptation to the fogginess and reduced solar radiation of this particular zone in a desert area.

Introduction

Changes in species number and density are among the most conspicuous responses of desert plant communities to the modification of the climate. The main single factor, is the availability of water. It is limiting most of the time, but whenever in surplus it triggers plant reproduction and germination with changes in plant species richness and number of individuals.

There are only few long term studies in deserts recording floristic changes (e.g. McGinnies, 1968) and fewer yet in the deserts of western South America (Péfaur, 1978). This study reports on a year-long study in the desert along the western coast of Peru, concerned with the floristic composition and seasonal changes of the communities present.

Geography of the Lomas

Xeric conditions prevail on the lowlands of western Peru. There are two types of vegetated areas in the Peruvian southern desert (Vargas, 1940). One is the set of river valleys cutting through the desert which are covered by a riparian type of vegetation. Here regional agriculture has developed. The other is a vegetational patchy belt on the seaward slope of the Coastal Range running parallel to the coast, and called the Lomas (Fig. 1).
The Lomas occupy a total of ca. 8 000 km\(^2\) in Peru (Tosi, 1960; Alberts, 1947). They extend from ca. 8°S in N. Peru, to 30°S in N. Chile (Engel, 1973; Ferreyra, 1960; Weberbauer, 1939). In general, they follow the contour at which oceanic fog is stopped by the mountains, usually between 600–900 m, but in some places down to 300 m and up to 1 000 m. In exceptionally wet years, both altitudinal limits expand considerably. Beyond the summit on the lee side of the Coastal Range a cactus-dominated xeric plant formation occurs.

The general aridity of the SW region of Peru is due to the meteorological and hydrographic features of the adjacent portion of the South Pacific Ocean and to the local topography. Both the Andean Cordillera and the Coastal Range determine the pattern of wind circulation. The barrier effect presented by the Coastal Range to the sea breeze and its rise are responsible for the adiabatic cooling effect of the air masses – if the air is saturated, moisture condenses into fog or light rain (Ferreyra, 1953, 1961; Craig & Psuty, 1968; Péfaur & Cáceres-Péfaur, 1974).

The seaports of Matarani and Mollendo, the climatic stations closest to the study site, have few years of records, but they provide an insight of the small amount of precipitation falling in W. Peru. Matarani records less than 8 mm/yr and Mollendo 20 mm/yr. Lomas temperature fluctuates between 13 °C (June) and 21 °C (January). Values are relatively high during the summer months (December to April) and relatively cool for winter (June to November). A climatological comparison of the Lomas under study and those of Lachay, in central Peru, shows similar patterns in both temperature and precipitation (Aguilar, 1973; Péfaur, 1978).

**Methodology**

The study was carried out along a wide ravine that deeply incises the maritime terraces and the Coastal Range in front of the seaport of Matarani. As in most of the Lomas, four vegetational zones can be recognized: I) a xeric zone on the sandy terraces below 400 m; II) a subxeric zone in the less dry area of occasional condensation of fog between 450 and 550 m; III) a mesic zone maintained by the fog condensation and protected by a nearly continuous cloud-cover, extending from 600 to 850 m; and IV) a submesic zone existing from 900 to 1 020 m (the top of the mountains) and maintained by the dissipating fog. These zones are equivalent to those reported by López (1977). This altitudinal sequence is not equal to a directional moisture gradient, for the wettest and most equal of all the zones is III; zone IV is the next in respect to moisture,