VEGETATION DISTRIBUTION FROM A COASTAL DUNE SYSTEM IN SE SPAIN: RELATIONS WITH SOIL SALINITY, MOISTURE AND REDOXIMORPHIC FEATURES

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1.- SITE DESCRIPTION

This study was conducted in the coastal Regional Park of "Salinas de San Pedro" (~ 84 ha), Murcia, SE Spain (Figures 1 and 2). The zone is characterized by a semiarid Mediterranean climate, with a mean annual rainfall of 275 mm, most of which falls in autumn and spring. The mean annual temperature is 17 °C, and mean evapotranspiration rate is 856.8 mm per year. The site has irregular micro relief that lead to complex relationships between water regime, soil development and plant distribution. Two main landscape situations were recognised: topographically higher positions (summit of the dunes) and inter dune depressions with variable slope and variable surface at the bottom. Four positions could be identified in the inter dune depressions: backslope, footslope, toeslope and bottom. The position of plant communities varied in different inter dune depressions probably due to the differences in size and slope of these depressions: the most extensive one generally had a complete series with bare soil in flat zone at the bottom and succulent halophytes at the footeslope, but the smaller depressions tended to have a concave form at the bottom with *Juncus maritimus* generally growing there (Figure 3).

Figure 1. Location map and aerial images of the study site in SE Spain.

Figure 2. Partial views of the study site

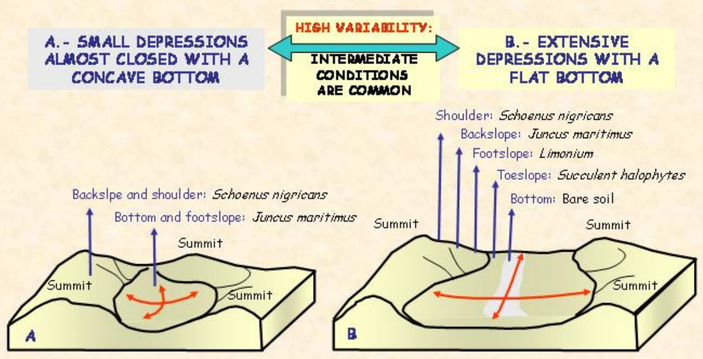


Figure 3. Morphology of the interdune depressions.

2.- MATERIAL AND METHODS

2.1.- Sampling. The main plant communities (zones dominated by one species with more than 50% cover) were recognized and surface 20 cm soil samples (five for each plant community) were taken as follow: A.- Summit positions: samples were taken from zones dominated by: 1) thyme brushwoods (*Helianthemum* and *Teucrium* mixed); 2) *Crucianella maritima*; 3) *Ammophila arenaria* and 4) *Lygeum spartum*. B.- Inter dune depressions: samples were taken from 1) *Schoenus nigricans* (backslope or footslope); 2) *Juncus maritimus* (footslope, toeslope or bottom); 3) *Limonium* sp (backslope or footslope), and 4) succulent halophytes (*Arthrocnemum macrostachyum* and/or *Sarcocornia fruticosa*, always at the toeslope and bottom positions) alone or 5) mixed with *Limonium* sp, *Juncus* and others. In addition, five samples were taken from bottom positions at inter dune depressions with bare soil. As a result of the combination of type of vegetation and topographic positions, the total number of samples was 95. The samples were taken in spring (March).

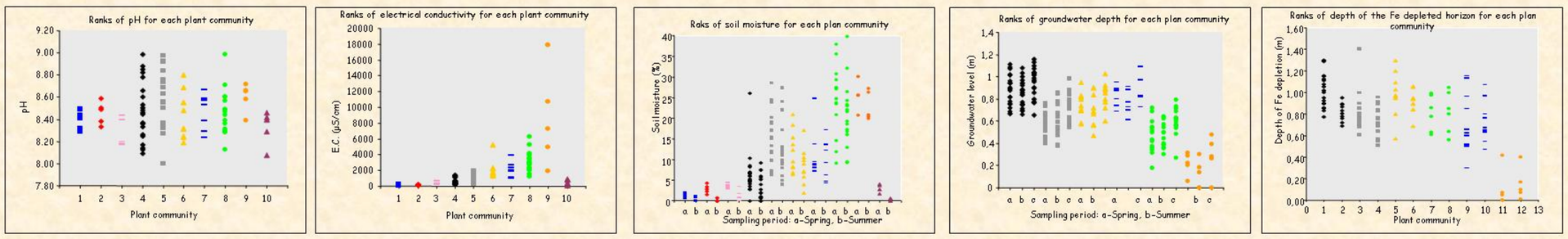
In each sampling plot from interdune depressions the depth of the groundwater was taken in spring (March), early summer (May) and summer (August). The measures were obtained in two points of each plot by making manually holes. In the same holes the depth of the redox concentrations (Fe^{3+} mottles) and anoxic conditions (indicated by the presence of a grey horizon -Fe depleted, Figure 4) was taken in spring (March) and summer (August).

Figure 4
Fe depletion (grey colour).

2.2.- Analysis. Moisture was obtained drying the samples at 105°C; pH and electrical conductivity were determined in a 1:1 soil:water suspension.

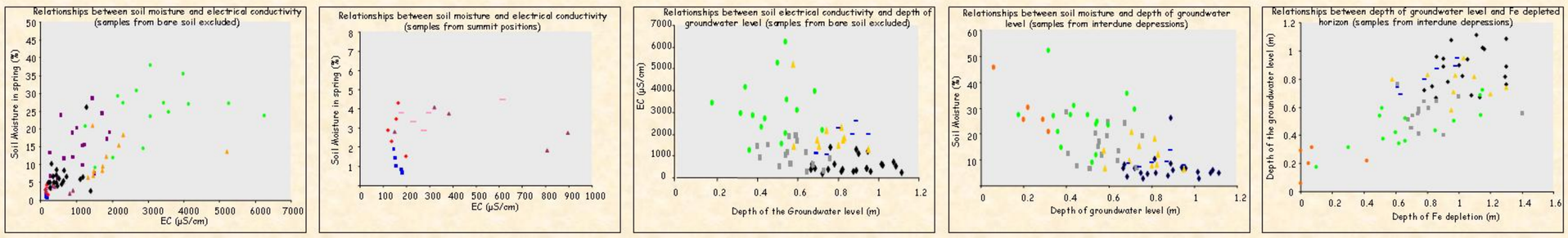
3.- RESULTS AND DISCUSSION

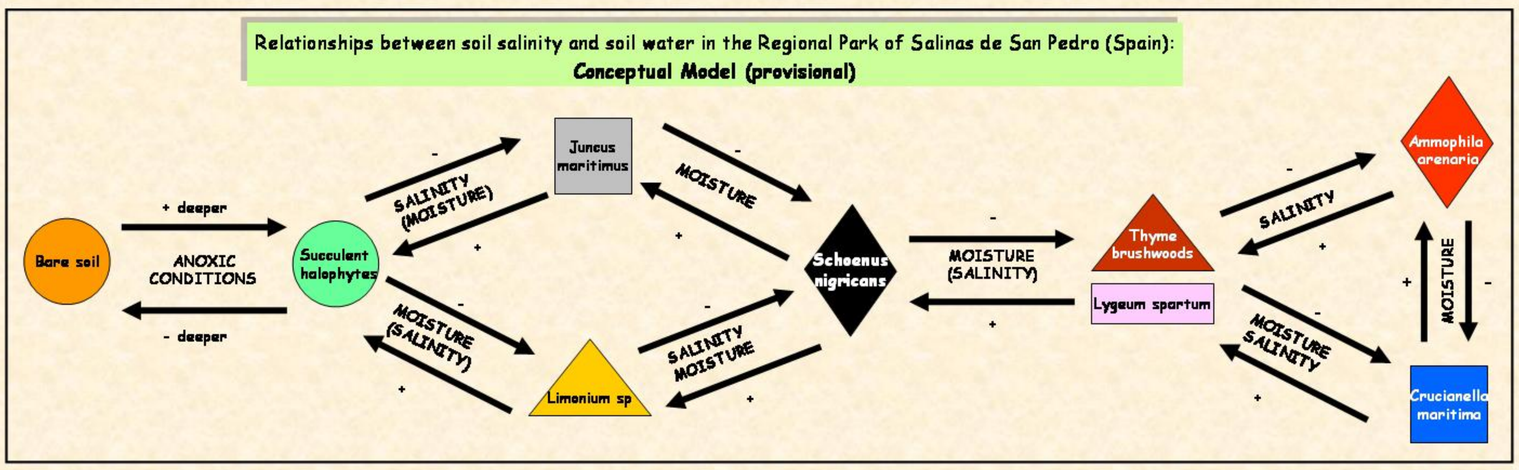
3.1.- Soil parameters measured. Electrical conductivity, soil moisture, groundwater level and depth of the anoxic horizon (indicated by the existence of a Fe depleted horizon) showed some relation with vegetation stands, but pH did not. The depth of the anoxic conditions seem to be the main factor limiting plant establishment: samples from bare soil were better discriminated by the depth of the Fe depleted horizon than for the others variables.



Plant communities.
- *Crucianella maritima*
- *Ammophila arenaria*
- *Lygeum spartum*
- *Schoenus nigricans*
- *Juncus maritimus*
- *Limonium sp.*
- Mixed stand
- Pure stand of succulent halophytes
- Bare soil
- *Thyme-brushwoods*

3.2.- Relationships between soil parameters. Based on the results obtained, vegetation distribution in the study zone could be explained by gradients of moisture and salinity.





Research in progress.

- Seasonal variations in soil salinity and pH
- Relationships among temporal variations in soil salinity and moisture with plant distribution
- Measures of ions in soil solution
- Relationships among ions in soil solution with plant distribution
- Detailed relationships among micro-topography, soil parameters and plant distribution
- Look for biological (changes in species distribution) and physical (changes in soil-water parameters) indicators of changes (e.g. natural tendencies, anthropic disturbance, climatic changes, etc.)

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