



DYNAMIC OF A MANGROVE FOREST OF *Rhizophora mangle*, MANATEE SECTOR, NATIONAL PARK LAGUNA DE TACARIGUA, VENEZUELA.

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Abstract

The National Park Laguna de Tacarigua is a coastal wetland located in the north central coast of Venezuela, mangroves are the main feature of this ecosystem and sedimentation is the most notable problem which is affecting the communities' dynamics of *Rhizophora mangle* presents. This work was a characterization of the mangrove forest of *Rhizophora mangle* in the island called Manatee, in order to contribute to the conservation of plant and animal biodiversity Tacarigua's Lagoon support. The investigation used a methodology integrated satellite images, field samplings realized from June 2009 until June 2010, and statistical analyses. In fieldwork measured pore water variables, community variables and took soil samples in plots along to the gradient from the border with the lagoon towards the interior of Manatee Island. Along the gradient the soil and water conditions turned out to be similar from the border up to some 20m towards the interior. ANOVA results indicated that salinity and conductivity pore water were the most significant variables. The density of the different developmental stages of *R. mangle* revealed a colonization phenomenon of seedlings and the successful establishment to the border with the lagoon and gaps. Nevertheless, nowadays has been established a gap dynamics where this gaps left by the fall of dead adults of *R. mangle* are colonized for this mangrove specie and for a second light tolerant species seedling such as *Laguncularia racemosa*.

Introduction:

The mangrove forests constitute the principal characteristic of the ecosystem Tacarigua's Lagoon, located on the central coast of Venezuela and included in the National Parks system and a list of Convention on Wetlands of International Importance RAMSAR. *Rhizophora mangle* L., red mangrove, is the dominant species, distributed to the border and on deposit sediments banks in the lagoon (Calzadilla Perez 1995). The sedimentation is the most significant problem (Calzadilla Pérez et al. 2002) this disturbance has allowed the colonization and establishment of *R. mangle* on the water in the shape of islands of varied extensions (Barreto y González 1994). This work realized the dynamic characterization of the mangrove forest of *Rhizophora mangle* in the island called Manatee, in order to contribute to the conservation of plant and animal biodiversity Tacarigua's Lagoon support.

Objectives:

Characterize the dynamic of a mangrove forest of *Rhizophora mangle* in the Manatee Island in the National Park Tacarigua's Lagoon. Determine the structure of this mangrove forest and realize physicochemical measurements in the pore water and analyze soil samples in the study area.

Material and Methods:

The study area was Manatee Island located inside the National Park Tacarigua's Lagoon limits. The climate is warm and wet with an annual average temperature of 26°C. The total annual rainfall in the area is 1,000 millimeters with 85% of the rainfall between June to December. Used free satellite images processed with GIS free programs, an image from satellite ETM Landsat-7 program (available free in <http://glovis.usgs.gov/>, USGS United States Geological Survey) and a multispectral image of high resolution from satellite SPOT 5. The "Guapo" River is the principal contribution of fresh water to the ecosystem. The fieldwork fulfilled between June 2009 to June 2010, in plots samples method along 50 m length in the water depth gradient from the lagoon border towards the interior of the Manatee island, for a 15 total located ones 5 in the northern and 10 in the

southern part. In the plots there measured pore water variables (pH, temperature, salinity, conductivity, dissolve oxygen and Redox potential) and community (total height, canopy coverage, density of individuals of agreement development stage and dead adults of *R. mangle*), and soil samples to determine salinity by loss on Ignition method and organic matter.

Results:

The Principal Component Analysis PCA indicates similarities in the edaphology conditions to the border and to 20m towards the interior. The ANOVA results, indicated that the pore water salinity and conductivity were the most significant variables ($P < 0.05$). The average soil salinity was $49.34 \pm 12.41\%$, higher in North Manatee with regard to South Manatee, in turn it increased notably along the gradient from the border towards the interior of the island.

The total number adults were 217 trees, of which 82 % corresponded to *R. mangle* and 18 % to *Laguncularia racemosa*. These values together with coverage and diameter at breast height (dbh) values confirm the red mangrove dominates. In the plots adult individual's density decreases from the border towards the interior of the island, to lowest adult density was higher seedlings density. The density of the different development stages of

R. mangle in Manatee island, revealed a colonization phenomenon of a new seedlings cohort of red mangrove and the establishment success, towards the border with the lagoon and gaps where the density of dead adults was higher. The gaps by the fall of dead adults they are colonized *R. mangle* seedlings and a second light tolerant species as *L. racemosa*.

Discussion:

Along the gradient there was demonstrated the effect of the water depth and tide on the pore water salinity. The variations of salinity are directly associated with the changes of neighboring to the lagoon water, the magnitude of water flows and climatic global and regional conditions (Casas-Monroy and Perdomo-Trujillo 2001). The measurement of pore water salinity it is considered to be a relative value, because depends directly on the soil water layer by tides, flows of fresh water and the year period when the measurements were realized. This was the implication to determining the soil salinity, which was higher in North Manatee that corresponds to lowest depth and water volume. The salinity of the soils determines the spatial distribution of the mangroves forests in the coastal zone (Rivera-Monroy et al. 2006).

Regard to colonization phenomenon and establishment success in gaps by red mangrove, Lopez-Hoffman et al. (2007) indicated that physiological shade intolerance of *R. mangle* seedlings might be the result promotes high indexes of growth in gaps. Several investigations was document the mangrove establishment corresponds to gradients of irradiation across gaps (Ward et al. 2006), whereas the initial conditions of the forest structure and recruitment rates are the determinant characteristics of the development of a mangrove forest (Chen and

Twilley 1998). In contrast, Lopez et al. (2011) in several mangroves forests in the central region western of Venezuela, dead individuals did not find, as well as seedlings were contributing to potential forest regeneration.

Conclusions:

In the mangrove forests of Mantee Island, the gaps were colonized for *Rhizophora mangle* seedlings and for a second light tolerant, *Laguncularia racemosa*. In these processes of selective cut of the forests of swamp, the opening of clear offers the possibility of settling to other species, they modify the dynamics of these ecosystems. In these processes of mangrove forest selective cut, the opening of gaps offers the possibility of settling colonized to other species, they modify the ecosystem dynamics. The results of the pore water and community variables and soil analyzed constitute a contribution to the dynamics characteristics of this mangrove forest in Manatee island on Tacarigua's Lagoon, available for future investigations, production of managing plans and sustainable management orientated in a legal regulations to use and conservation of this ecosystem and coastal wetland natural resources.

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