Mangroves of Colombia revisited in an era of open data, global changes and socio-political transition: homage to Heliodoro Sánchez-Páez
2019. Revista de la Academia Colombiana de Ciencias Exactas, Físicas y Naturales

Supplementary Material

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Database citation and availability

Blanco-Libreros, Juan; Álvarez-León, Ricardo, 2018, "HELIO_SP.CO v.1: Hierarchical, Entity-based and Landscape-level Information Observatory for mangrove SPecies in Colombia, version 1.", https://doi.org/10.7910/DVN/GGLRXW, Harvard Dataverse, V1, UNF:6:sD96FgJRjWrXmDUVqhUbqg== [fileUNF].

Brief description

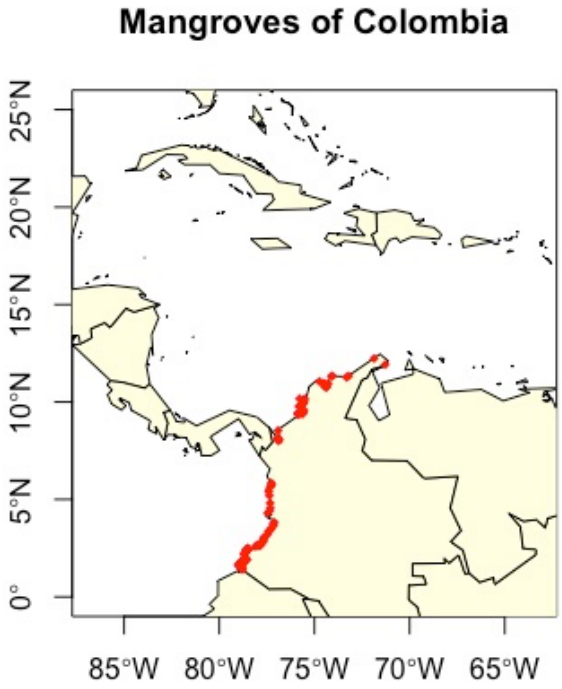
HELIO_SP.CO v.1 (Hierarchical, Entity-based and Landscape-level Information Observatory for mangrove SPecies in COlombia, version 1) reports point data for forest structure variables in 104 locations across the eleven states settled in both coasts (Pacific and Caribbean) in mainland, and covering a climatic gradient ranging from super-humid to desert. Four species are included: R: *Rhizophora* spp.; A: *Avicennia germinans*; L: *Laguncularia racemosa*; P: *Pelliciera rhizophorae*. Structure variables were included: density, diameter at breast height (DBH), Importance Value Index (IVI), and height (only for the Caribbean). Data are included only for trees of DBH>15 cm. Nineteen bioclimatic variables obtained from WorldClim 2 for the point-data reported in the first dataset were also included.

Methods

We transcribed the data included in the two main printed reports from the Mangroves of Colombia Project (Sánchez-Páez et al. 1997a, b). Point data (WGS84) for forest structure variables in 104 locations spanning from Nariño and Guajira, covering the eleven states settled in both coastal basins (Pacific and Caribbean) in the mainland. Data from the insular territory in the Caribbean (San Andrés and Old Providence) were not included due to its oceanic location in Western Caribbean close to the coast of Nicaragua in Central America. Biogeographic and macro-ecological patterns in this location are more influenced by dispersion, founder effects, and cyclone-induced disturbance regime than by other climatic and geomorphic controls operating in mainland. No data were reported for the Caribbean coast of Chocó (Darién Ecoregion). Data were included for Chocó, Valle, Cauca and Nariño and the Pacific basin, and for Antioquia, Córdoba, Sucre, Bolívar, Atlántico, Magdalena and Guajira. The geographic limits were: 1,41 (Candelillas del Mar, Nariño) and 12,23 (Mowasi, Guajira) in latitude, and -79,00 (Cabo Manglares, Nariño) and -71,28 (Puerto López, Guajira) in longitude (Supplementary figure 1). Positioning errors were corrected by using base imagery where mangrove areas were recognized, using ArcMap 10.3. In addition, corrections were based on expert knowledge, field visits and local studies when available.

Four true mangrove species were included (R: *Rhizophora* spp.; A: *Avicennia germinands*; L: *Laguncularia racemosa*; P: *Pelliciera rhizophorae*) despite the reports include non-mangroves and mangrove-associates (e.g. *Mora oleifera*). *Conocarpus erectus* was not included because of the reduced number of records. Mean density, mean diameter at breast height (DBH), Importance Value Index (IVI), and mean and maximum height (only for the Caribbean) were included for each species in each location. Data were included only for trees of DBH>15 cm because it could be better correlated with environmental variables as trees have survived the short-term bottlenecks and stochastic processes that may affect trees with DBH<15 cm.

For the locations reported above, we extracted the available gridded-climatic data from WorldClim 2 open database (www.worldclim.org; **Hijmans, *et al*.,** 2005, **Ficks & Hijmans,** 2017). Using a 2,5 minute resolution, to avoid bias due to coarse resolution, 19 bioclimatic variables were obtained to further classify the climatic space of Colombian mangroves and to explore correlations with biotic variables.



Supplementary figure 1. Locations of point data available in HELIO_SP.CO v.1. Plotting example using R statistical software (www.r-project.org).

Results

This database allows to describe the distribution of each mangrove species (Supplementary figure 2). According to IVI and density, it can be hypothesized that *Rhizophora* spp. is the foundation species, however *Avicennia germinans* reaches the greatest diameter (Supplementary figure 3). However, differences in IVI were observed between basins. *Rhizophora* exhibited greater IVI in the Pacific than the Caribbean, while *Avicennia* showed the reverse pattern (Supplementary figure 4). *Laguncularia* and *Pelliciera* also exhibited differences between basins. The spatially-explicit nature of this database allows

continuous plotting of the biotic variables relative to latitude and longitude (Supplementary figure 5). Using these coordinates cross-correlations could be explored with other open databases such as WorldClim for modelling purposes. A summary of state level mangrove characteristic was included for general reference, based on the MCP reports (Supplementary table 1).

References

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Hijmans, R.J., Cameron, S.E., Parra, J.L., Jones, P.G., Jarvis, A. (2005). Very high resolution interpolated climate surfaces for global land areas. Internat. J. Clim. **25:** 1965-1978.

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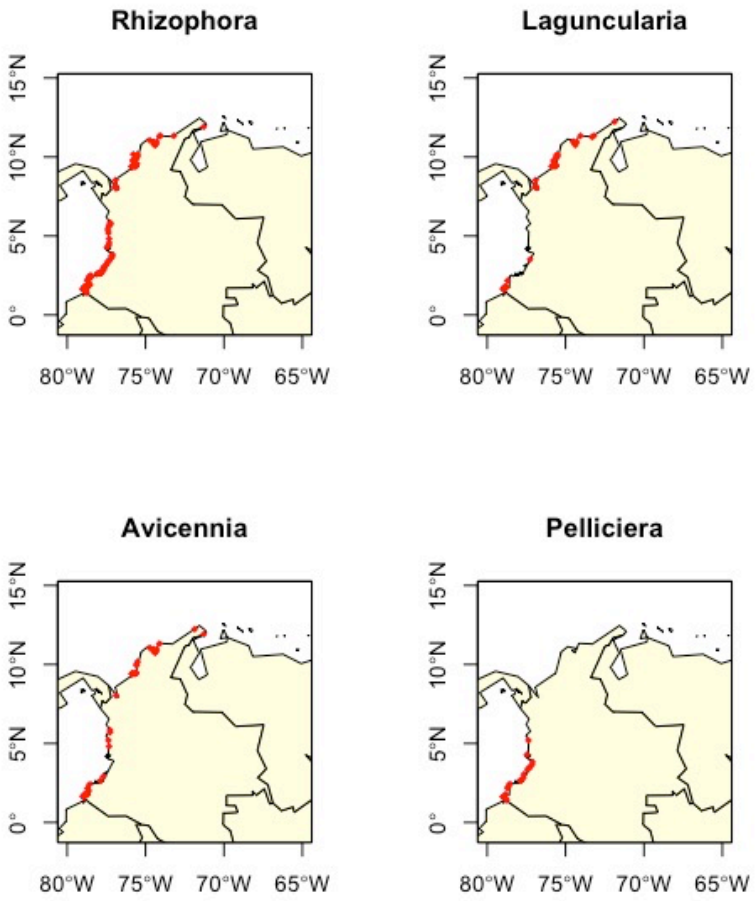
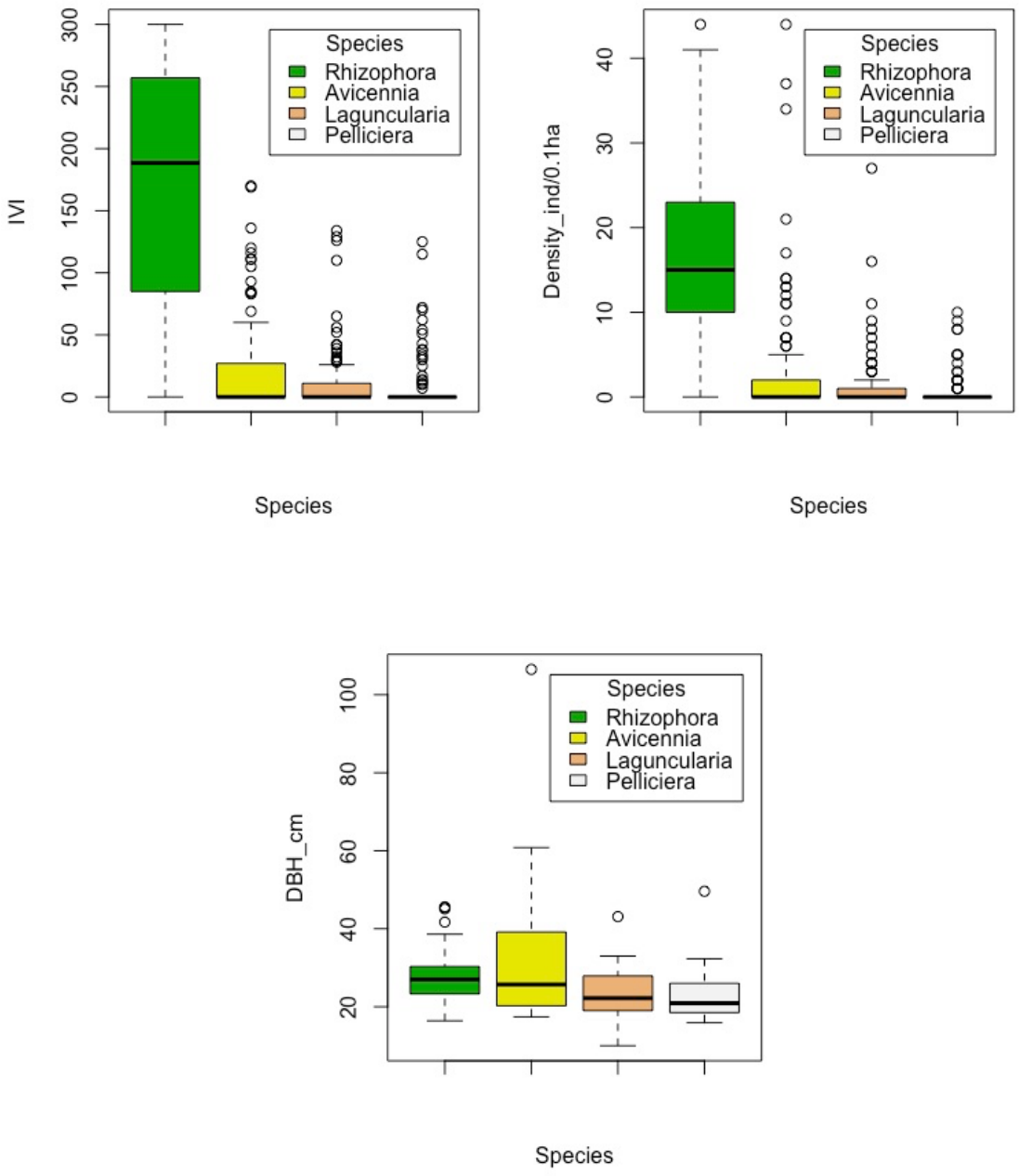
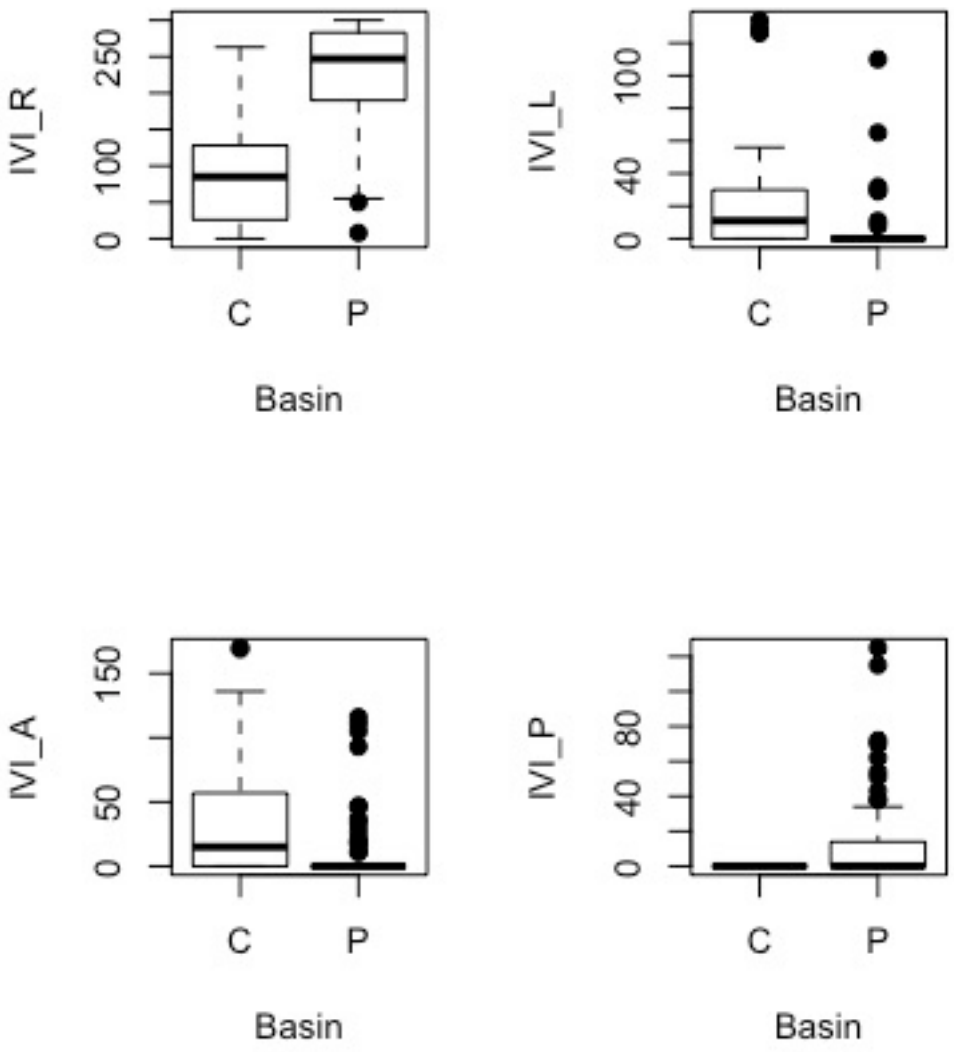
Sánchez-Páez, H., Álvarez-León, R., Guevara-Mancera, O.A., Zamora-Guzmán, A., Rodríguez-Cruz, H. & Bravo-Pazmiño, H.E. 1997b. Diagnóstico y zonificación preliminar de los manglares del Pacífico de Colombia, *In:* H. Sánchez-Páez & R. Álvarez-León (eds.) Proy. PD 171 / 91 Rev. (F) Fase 1. Conservación y Manejo para el Uso Múltiple y el Desarrollo de los Manglares en Colombia, MMA / OIMT. Santa Fe de Bogotá D. C. (Colombia), 343 p.



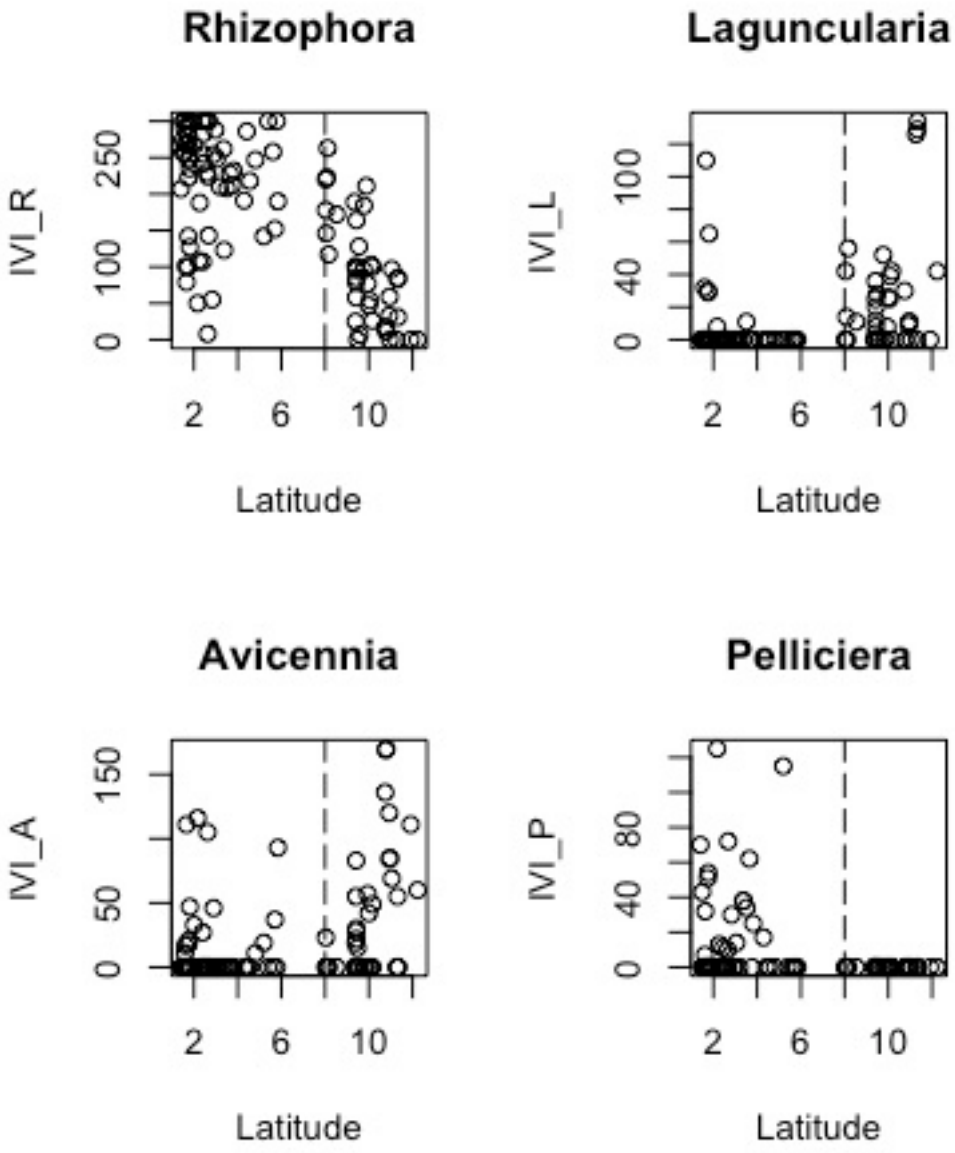
Supplementary figure 2. Locations where each mangrove species was recorded. Data for trees >15 cm in DBH.



Supplementary figure 3. Boxplots of IVI, density and dbh pooling nation-wide data,. Plotting example using R statistical software.



Supplementary figure 4. IVI per basin (C: Caribbean; P: Pacific). Plotting example using R statistical software.



Supplementary figure 5. IVI relative to latitude North. The vertical broken line represents the divide between Caribbean and Pacific basins. Plotting example using R statistical software.

Supplementary table 1. Summary attributes of mangroves for coastal states in the Caribbean and the Pacific in Colombia, according to MCP reports. San Andrés, Povidence and Santa Catalina islands, oceanic territories in the Caribbean, are included for comparison. The structure data for the coast of Chocó in the Caribbean (Darién region) were not included in the MCP reports.

State name	Latitude range (N)	Annual precipitation (mm)	Mean height (m)	Mean DBH (cm)	Mean basal area (m^2 ha^{-1})	Mean density (ind. ha^{-1})
GUAJIRA	11º 10´ - 11º 45´	1.550	10.93	18.11	2.14	16.31
MAGDALENA	11º 05´ - 11º 15´	1.200	16.98	46.23	2.19	15.61
ATLÁNTICO	10º 16´ - 11º 06´	750	4.50	25.00	-	-
BOLÍVAR	10º 58´ - 10º 04´	1.160	12.2	41.10	2.25	15.04
SUCRE	10º 04´ - 09º 26´	1.200	10.0	29.61	1.76	10.3
CORDOBA	09º 26´ - 08º 54´	1.425	15.8	13.24	1.96	13.19
ANTIOQUIA	08º 54´ - 08º 15´	3.271	16.7	31.10	1.97	30.64
CHOCÓ (Caribbean)	08º 15´ - 08º 40´	2.200	9.5	45.00	-	-
CHOCÓ (Pacific)	04º 17´ - 07º 20´	8.000	16.72	24.36	1.054	33.76
VALLE DEL CAUCA	04º 16´ - 03º 13´	6.200	10.47	12.30	0.64	231.21
CAUCA	03º 12´ - 02º 40´	5.600	19.63	20.25	1.647	200.76
NARIÑO	01º 28´ - 02º 39´	2.790	14.96	17.13	1.077	408.44
SAN ANDRÉS, PROVIDENCIA Y STA. CATALINA	12º 29´ - 13º 23´	1.798	11.37	29.58	5.49	82.07