

THE INTERPLAY OF SEAGRASSES MEADOWS, CORAL REEFS, AND EROSION IN MEXICAN CARIBBEAN COAST

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INTRODUCTION

The Mexican Caribbean is located on the eastern side of the Yucatan Peninsula in Mexico (Figure 1). The coastline covers 865.2 km (Hernández, Carreño, and Castillo 2018) and is mainly made up of sandy beaches and a small part of rocky shores without cliffs (Tello & Catellanos 2011). Coral reefs, seagrass beds, dunes, and mangrove forests are the most representative ecosystems along the coast. These ecosystems have a permanent change of matter and energy, so their functioning and health are closely related (Beltrán-Torres 2011). Likewise, each of these ecosystems is affected by different threats that put their health at risk, the interactions they maintain with the other ecosystems and the ecosystem services that they provide.

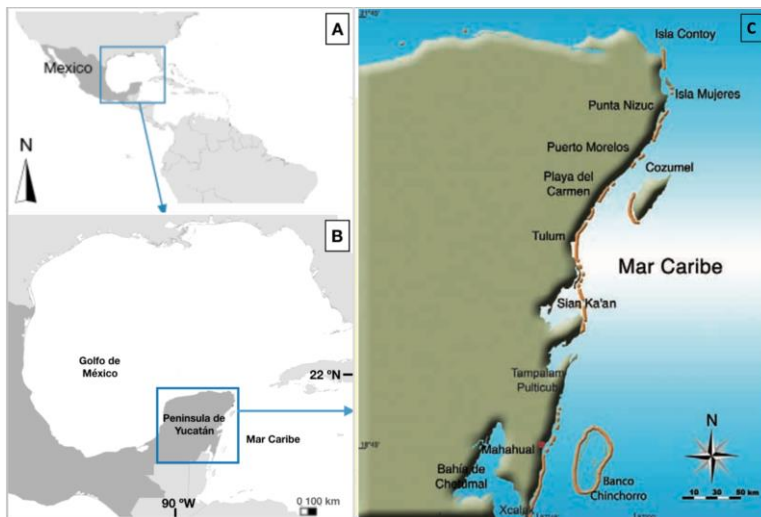


Figure 1: Location of the study area: A) Mexico. B) Yucatan Peninsula. C) Mexican Caribbean and location of the reef barrier (Taken from Beltrán-Torres 2011).

Erosion is one of the biggest problems worldwide that affect dune ecosystems. This phenomenon can be caused by threats of both anthropogenic origin (eg, anthropogenic alteration of the landscape), and natural origin (eg, tropical cyclones). Several works have pointed out the beneficial role that marine ecosystems play in avoiding beach erosion. The role of corals in reducing wave energy and preventing erosion is one of the most studied (Lowe et al., 2005, Monismith, 2007, Ferrario et al., 2014), while the role of seagrasses meadows have been less studied in research.

Interactions between ecosystems, physical-environmental characteristics and different types of threats generate complex systems that are difficult to study. This work aims to provide valuable information to understand these complex systems and determine the relationship between marine ecosystems and the erosion of the Mexican Caribbean coast. From geographic information systems, areas with similar ecosystems are identified. Afterward, using multivariate analysis techniques, it will be determined if there is a relationship between the presence of the different marine ecosystems and the degree of erosion in the study area. The questions that are intended to answer with this research are:

- Is the presence-absence of the reefs correlated with the erosion of the Mexican Caribbean coast?
- Is the presence of seagrass beds correlated with the degree of erosion present on the Mexican Caribbean coast?
- Which of these two ecosystems is more related to the retreat or advance of the Mexican Caribbean shoreline?

AVAILABLE BACKGROUND INFORMATION & DATA

Data of the three variables to be considered (erosion, coverage of seagrasses and presence of corals) is open use and available on the internet. The data of retreat or advance of the shoreline in meters is available via CONABIO (Comisión Nacional para el Conocimiento y Uso de la Biodiversidad; CONABIO 2016), as well as, the data about the coverage area of both seagrass beds and coral reefs. This information is planned to be work through the geographic information systems software QGIS. Subsequently, the generated information will be statistically analyzed using the software R.

BRIEF STATE OF THE ART

Each of the marine ecosystems plays an important role in the protection of coasts such as flood, sea level rise and coastal erosion; however, it has been observed that their degradation and loss can reduce their capacity to protect the coast (Lowe et al. 2005; Monismith 2007; Alvarez-Filip et al. 2009; Ferrario et al. 2014; Quataert et al. 2015; Yates et al. 2017; Beck et al. 2018; Mcfield et al. 2018). In a recent study, Reguero and collaborators (2019) point out the beneficial role of dunes in the Mexican Caribbean to face flood events. These authors estimate that the economic value of this ecosystem in the Mexican Caribbean is around 16.7 million dollars per year. Nevertheless, damage to the dunes does not only generate economic losses, Martínez and collaborators (2014) also point out that a large number of floral species exclusively grow in dune systems, consequently coastal erosion represents a threat to these species and the organisms that depend on them.

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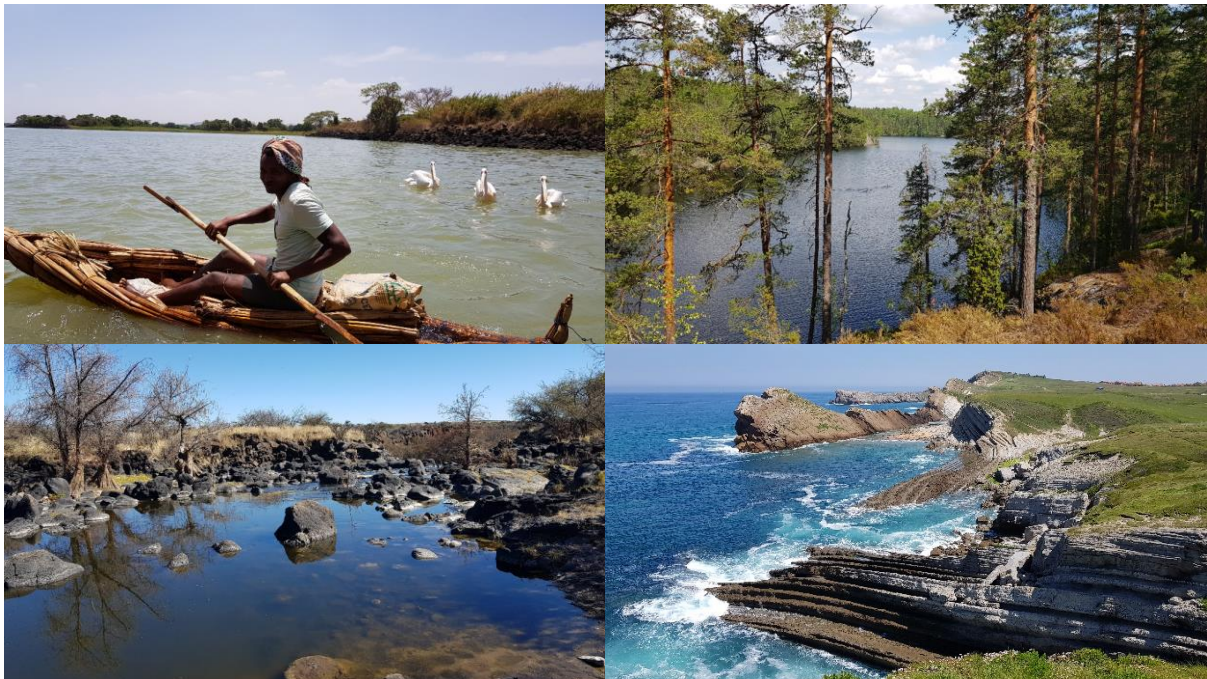
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EXCEED - SWINDON Conference 2019

THE FUTURE OF WATER RESOURCES

October 13th - 16th, Mérida, Mexico



Programme and Book of Abstracts

PROGRAMME

Sunday, 13 th		Arrival	
19:00	-	21:00	Welcome cocktail

Monday, 14 th		Conference Day 1	
08:30	-	09:00	Registration
09:00	-	09:30	Opening Ceremony <ul style="list-style-type: none"> • Norbert Dichtl • Andreas Haarstrick • Rodolfo Silva • Local authority
09:30	-	10:00	Keynote speech <ul style="list-style-type: none"> • Norbert Dichtl
10:00	-	10:10	Break
Session 1: The impact/performance/role of SDGs Chairman: Valeria Chávez			
10:10	-	10:30	Exploring some ocean energy possibilities in Latin America (Jassiel Hernández)
10:30	-	10:50	Water energy nexus in the MENA region (Abbas Al-Omari)
10:50	-	11:10	Ocean energy and marine biodiversity affectations: a life cycle assessment review (Dora Ruiz-Méndez)
11:10	-	11:40	Coffee Break
Session 2: Water-Energy-Nexus (I) Chairman: Dwi Andreas Santosa			
11:40	-	12:00	Wastewater/waste to energy in MENA region: A review for opportunities (Zeinab Abou Elnaga)
12:00	-	12:20	Water-energy nexus in a wastewater treatment plant: Energy efficiency and recovery (Wang Hongtao)
12:20	-	12:40	From wastewater treatment plants to a resources recovery facility (Marcelo Nolasco)
12:40	-	13:00	Seasonal assessment of the energetic potential associated with salinity gradient: Champoton River, Mexico (Gregorio Posada Vanegas)
13:00	-	14:30	Lunch
Session 3: Water, ecosystem and socio-economic integrating aspects (I) Chairman: Germán Rivillas			
14:30	-	14:50	Decolourization and mineralization of acid green 25 dye through single and catalytic ozonation (Liliana Amaral Féris)

14:50	-	15:10	Adsorption of naphtholate-as dye in wastewater of batik industry using green synthesized zn layered hydroxyl salts (Sri Juari Santosa)
15:10	-	15:30	Adsorption of hexavalent chromium in coal beneficiation tailing in fixed bed column (Liliana Amaral Féris)
15:30	-	15:50	Kinetics of the adsorption of anionic and cationic dyes in aqueous solution by low-cost activated carbons prepared from sea cake and cotton cake (Ibrahim Tchakala)
15:50	-	16:10	Distribution of microplastics in water and sediment in a Biosphere Reserve (Cecilia Enriquez)
16:10	-	16:30	Evaluation of microplastics contamination in the margins of the Patos Lagoon in south of Brazil (Eduardo Saldanha Vogelmann)
16:30	-	17:00	Coffee Break
Session 4: Water, ecosystem and socio-economic integrating aspects (II) Chairman: Rodolfo Silva			
17:00	-	17:20	Hydrodynamic modelling of the Huave Lagoon System, Oaxaca (María Fernanda González Amador)
17:20	-	17:40	Impact effects of hard infrastructure in Salamanca Natural Park (Juan Carlos Caez-Perez)
17:40	-	18:00	The decision-making in face to coastal squeeze, analysis between social and economic impacts: Case study of Campeche, Mexico (Debora L. Ramírez-Vargas)
18:00	-	18:30	Keynote speech • Elvis Carissimi
20:00			Dinner

Tuesday, 15th		Conference Day 2	
Session 5: Water, ecosystem and socio-economic integrating aspects (III) Chairman: Arwa Naser Damen Hamaideh			
09:00	-	09:20	Dispersion of submarine groundwater discharges in reef lagoons and associated environmental effects (Arlett Rosado Torres)
09:20	-	09:40	Salt intrusions into a freshwater spring in a tropical coastal lagoon, Yucatán, Mexico (Xaní Malagón)
09:40	-	10:00	Variability of the saline gradient in a hypersaline coastal lagoon (Brenda Natalia Fitch Geymonat)
10:00	-	10:20	Sedimentation and water quality status of lake Tana, the headwaters of the Blue Nile, Ethiopia (Seifu A Tilahun)
10:20	-	10:40	An innovative approach to mitigate risks on the existing iron tailings dams in Brazil (Jose Araruna)

10:40	-	11:00	Urban sustainable water management and water efficiency improvement for buildings – a case study for Istanbul (Ahmet Baban)
11:00	-	11:30	Coffee Break
Session 6: Water-Energy-Nexus (II) Chairman: Eduardo Saldanha Vogelmann			
11:30	-	11:50	Reverse electrodialysis for energy and water: coupled systems based in salinity gradients (Mateo Roldan-Carvajal)
11:50	-	12:10	Development of graphene oxide membranes for its use in reverse electrodialysis systems (Eddie López Honorato)
12:10	-	12:30	Development of graphene oxide based materials for water treatment (Ana Cecilia Reynosa Martinez)
12:30	-	12:50	Laboratory experiences on marine energy conversion devices for supplying electricity demand of remote coastal communities (Jassiel Hernández)
12:50	-	13:10	Plate type obstacles used for coastal protection and power generation (Luis Eduardo Pérez Paez)
13:10	-	14:40	Lunch
Session 7: Water, ecosystem and socio-economic integrating aspects (IV) Chairman: Thi Thanh Van Ngo			
14:40	-	15:00	Evaluating combinatorial water treatment by locally available materials (Chrispin Kowenje)
15:00	-	15:20	Desalination by capacitive deionization as a tool to provide drinkable water to small communities in the Brazilian semiarid (Luis Augusto Martins Ruotolo)
15:20	-	15:40	Fluoride ions removal from groundwater by alumina adsorption (Elvis Carissimi)
15:40	-	16:00	Bio-refineries: A new concept towards green energy production from agroindustrial wastewater (Víctor Alcaraz)
16:00	-	16:20	The importance of water and nutrients management in paddy fields as an effort to increase crop yields and producing an electrical energy through microbial fuel cells (Dwi Andreas Santosa)
16:20	-	16:50	Coffee Break
16:50	-	17:20	Keynote speech • Klaus Fricke
16:50	-	18:00	Panel discussion Moderators: Edmilson Santos de Lima and Norbert Dichtl
20:00			Gala dinner