Faunal, stable isotope and morphological variability of ostracods in Lago Enriquillo (Dominican Republic) during dry season

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1. Introduction

Tropical cyclones (hurricanes in the northern hemisphere) (TCs) are amongst the most devastating of the world's natural disasters and cause billions of dollars of damage every year. The unreliable, fragmented instrumental record of hurricane impacts offers only a short glimpse and precludes forecasting of timing and frequency of hurricanes. So far, information of paleo-TCs is mostly based on overwash deposits (i.e., marine sediments transported into coastal lakes). Unfortunately, these deposits preclude unambiguous differentiation of paleo-TCs and tsunamis. Our research aims on the development of a novel stable isotope-based approach for the reconstruction of paleo-TCs through the integration of ecological and morphological data with geochemical signatures of modern ostracodes from a tropical lake located within the main development region of TCs in the Caribbean region (Lago Enriquillo, Dominican Republic).

Our `natural laboratory´ Lago Enriquillo is well suited for our research due to its endorheic character, strong seasonal contrasts in precipitation, and exposure to precipitation extremes. Strong fluctuations of lake levels and salinity on annual to decadal scales prove that the lake is a dynamic system that is susceptible to short-term and long-term hydrologic variations.

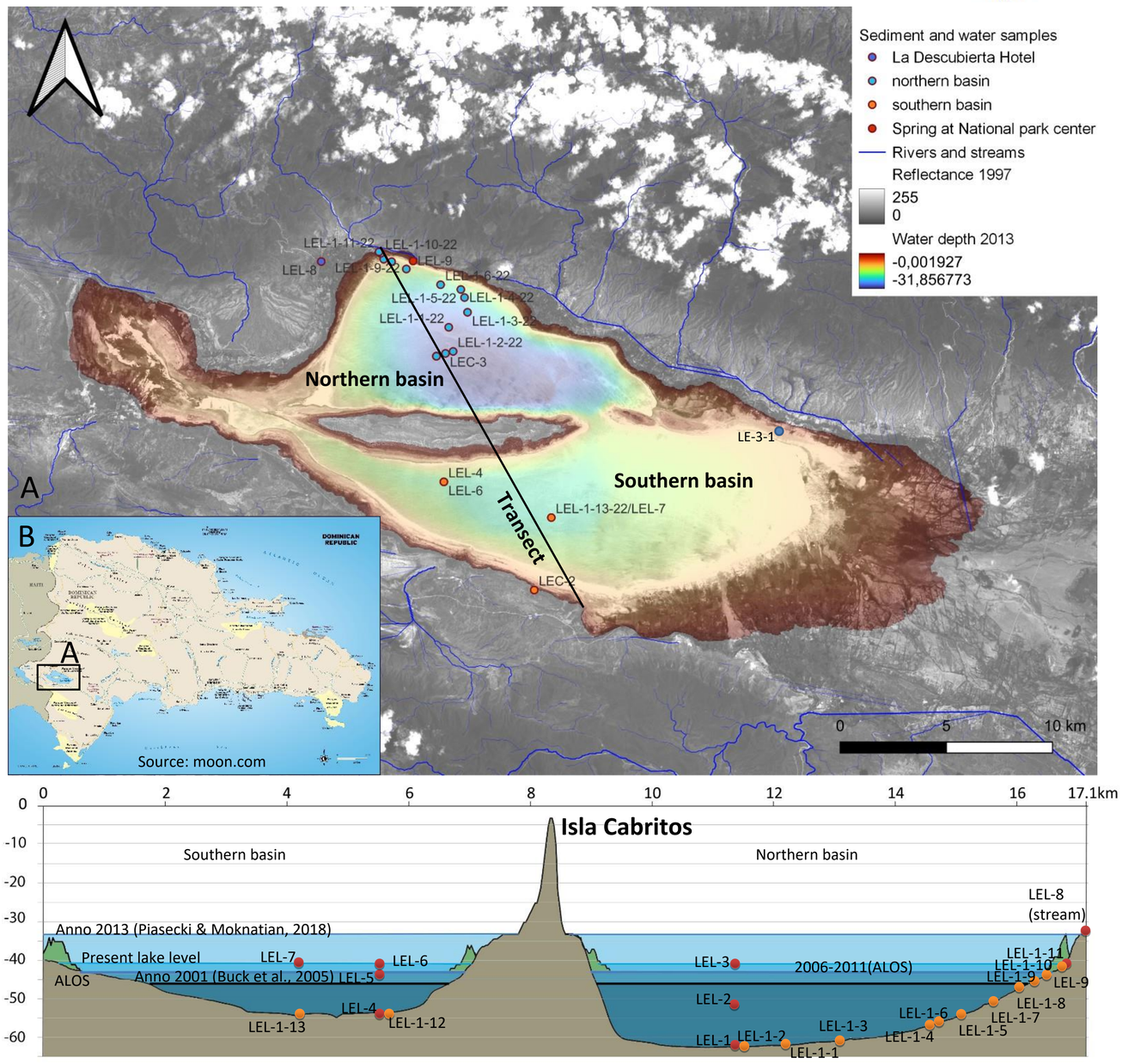

Fig. 1: A: Satellite image (SPOT, 1997) of Lago Enriquillo with sampling locations , bathimetric data from Piasecki & Moknatian (2018) and a SW-NE transect through Lago Enriquillo with different lake levels since 2001. Green represents coastal tree vegetation (inferred from ALOS data). Red dots are water sampling locations and orange dots are surface sediment sampling locations projected on the transect line.

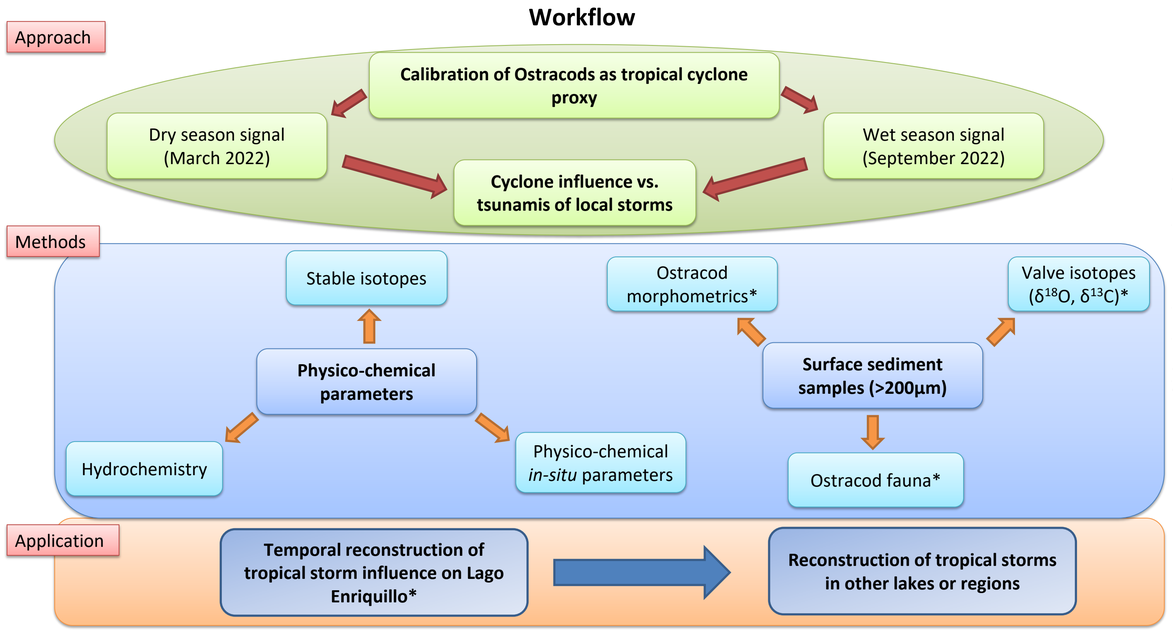

Fig. 2: Workflow chart of the overall project: Surface sediment samples taken during the dry and wet (i.e., hurricane) season are used to get seasonally specific information on hydrochemistry, ostracod species distribution, morphological variability, and stable oxygen and carbon isotope composition. These calibration data sets will be applied to fossil ostracod species assemblages from sediment short cores of Lago Enriquillo in order to reconstruct precilpitation/evaporation history and paleo-TCs of Lago Enriquillo.

2. Results

Lago Enriquillo modern ostracodes are characterized by two living species at present which occur in shallow water depths (upper 7m) and 14 species in total. The most common ostracods of the lake are *Thalassocypria sarbui* (Bold, 1960) and *Cyprideis similis* (Brady, 1869). While *C. similis* reaches its maximum aboundance about 3m water depth, *T. sarbui*‘s maximum abundance appears to be slightly deeper, at about 5m water depth. *T. sarbui* seems to withstand the lake‘s conditions slightly better than *C. similis* since *T. sarbui* is living also in deeper waters, while C. similis is mostly absent below 7m. *Perissocytheridea* was found commonly two-valved, but living species were not found. A selection of other species which lived in the near recent past inside the lake are shown in Fig. 4 E to K. A differentiation between biocoenosis (valves/carapaces with complete soft parts) and thanatocoenosis (empty two-valved carapaces) data show a similar distribution. Taphocoenosis data indicate a generally low influx of transported old ostracod valves (not shown); only LEL-1-8-22 (7.2m water depth) contains a high number of transported valves from different species with a dominating *Cyprideis salebrosa* Bold, 1963. The current water conditions are hypersaline, similar warm to the local average temperature, alkaline, Na-Cl dominated and well oxygenated except in depths greater than 20m (Table 1).

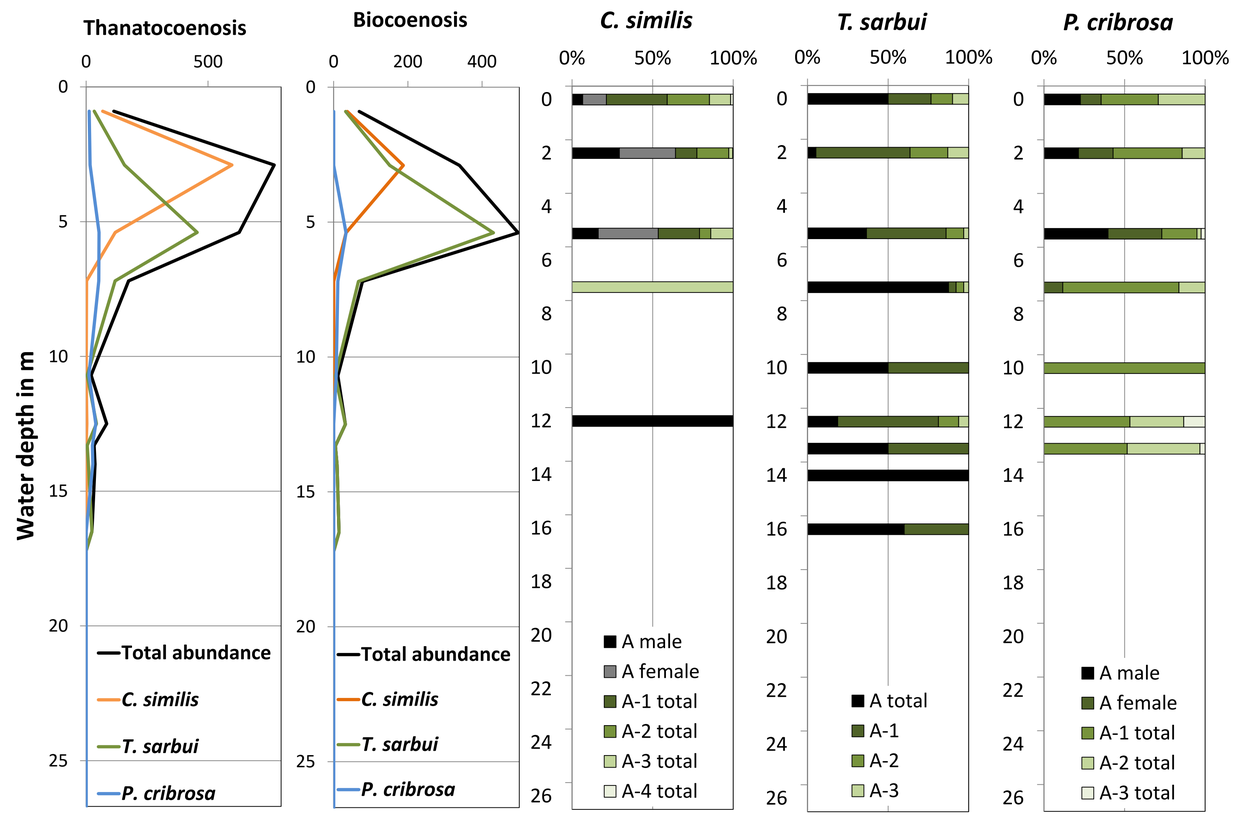

Fig. 3: Number of living (*C. similis* and *T. sarbui*) and two-valved (P. cribrosa) individuals within Lago Enriquillo per 100ml sediment volume and their ontogenetic proportions

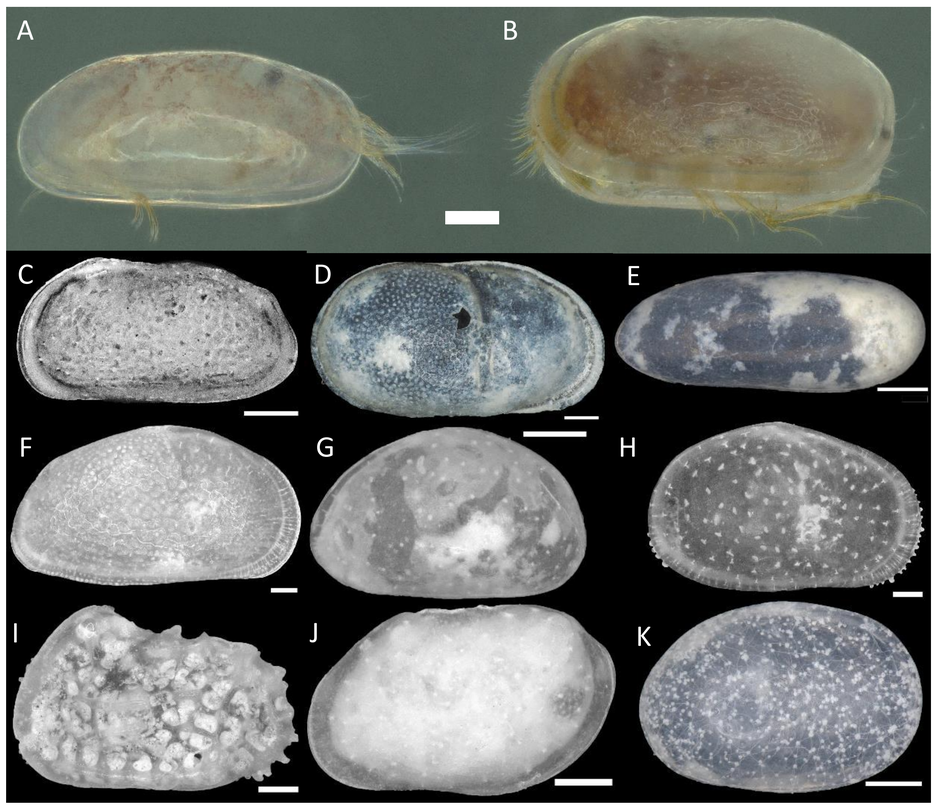

Fig. 4: Overview of ostracode species inhabiting Lako Enriquilllo.
Ostracod photographs by using Keyence VX-7100. Bars are 100µm. A: *Thalassocypria sarbui*, living, female, right side; B: *Cyprideis similis*, living, female, right side; C: *Perissocytheridea cribrosa*, two-valved, male, left side; D: *Cytheridella ilosvayi* Daday, 1905, RV, female; E: ?*Alicenula furcabdominis* (Keyser, 1975), LV; F: *Cyprideis salebrosa* van den Bold, 1963, RV, male; G: *Xestoleberis* sp., RV, H: *Peratocytheridea setipunctata* (Brady, 1869), female, RV, I: *Jugosocythereis* aff lactea (Brady, 1866), LV; J: *Loxoconcha* sp. , female, RV; K: *Physocypria* sp. , RV. A-D from lake samples collected with Ekman grab sampler, E-K from sample of near-Recent beach sediments (LE-3-1).

3. Concluding remarks

These preliminary results show that:
(1) the ostracod species *C. similis* and *T. sarbui* are dominant and show a slightly different spatial distributions,
(2) the thanatocoenoses and biocoenosis show a similar species composition and abundances,
(3) the analyses of stable isotopes will focus on those three species
(4) the taphocoenoses of very recent material contains a variety of other species than at present so that faunal changes due to environmental shifts are distinct

	Unit	Lake (Avg)	Source	Tributary
Na [g/L]	g/L	15,79	6,62	4,62
Mg [g/L]	g/L	1,79	1,65	1,12
K [mg/L]	mg/L	521,61	249,31	132,48
Ca [mg/L]	mg/L	393,51	9482,75	6296,44
Fe [mg/L]	very low	very low	very low	very low
Cl [g/L]	g/L	25,97	0,12	very low
SO4 [g/L]	g/L	5,31	very low	very low
HCO3	mg/L	648,08	588,18	577,54
δ18O	mUr (VSMOW)	4,06	-3,72	-4,09
δ2H	mUr	22,31	-17,70	-16,10
pH (lab)	-	8,00	7,78	7,79
pH (field)	-	7,73	6,76	7,87
Tempterature	°C	28,10	24,55	20,80
Salinity	psu	44,89	0,44	0,17

Table1: Results of the physical and chemical parameters of the water samples from Lago Enriquillo

Acknowledgements

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References

Piasecki, M., & Moknatian, M. (2018). Bathymetry Data for Lakes Azuei and Enriquillo.