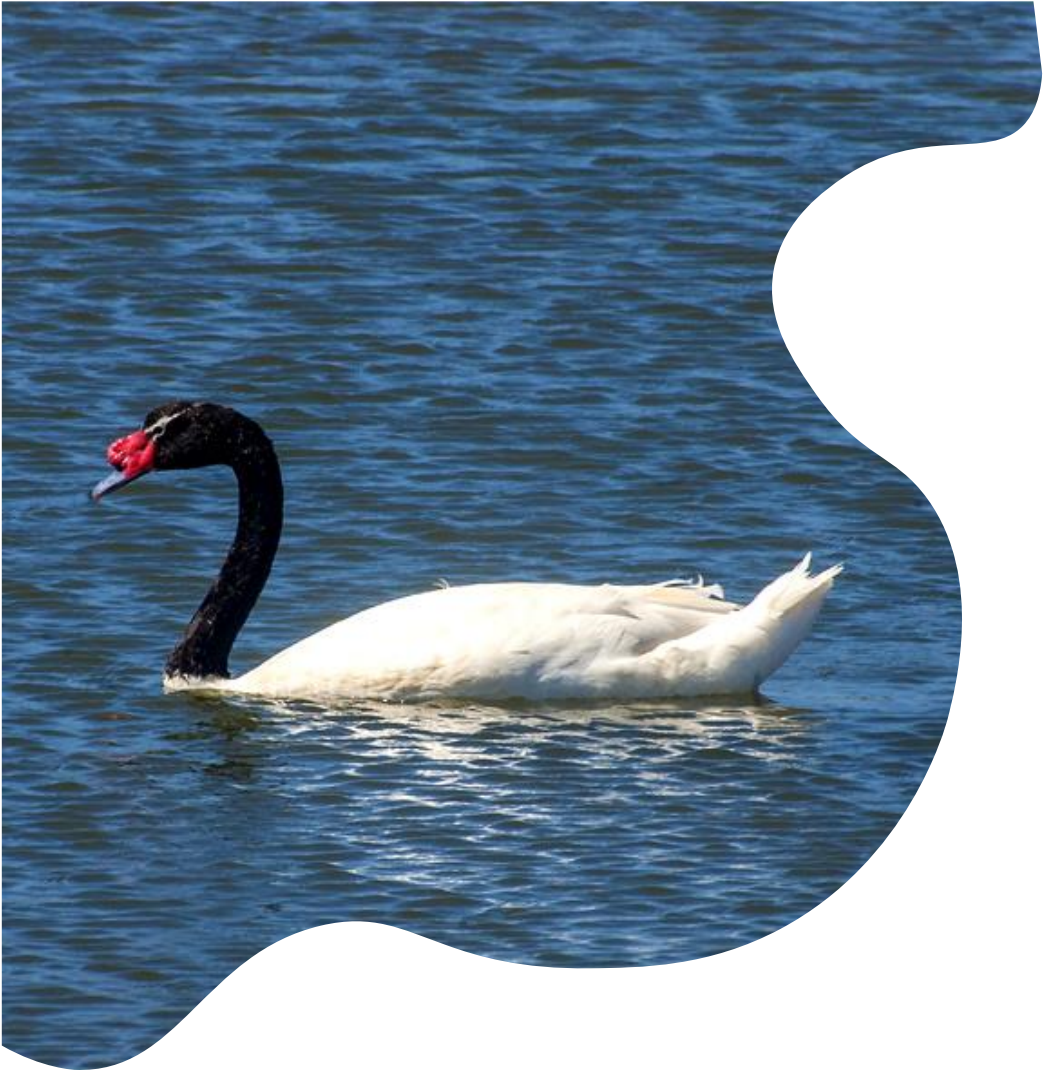

Abstract Book

SETAC Latin America 14th Biennial Meeting

Latin America, Diversity of Knowledge for a Sustainable Future

26–29 SEPTEMBER 2021 • VIRTUAL

Abstract Book

SETAC Latin America 14th Biennial Meeting

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This book comprises the abstracts of the presentations for the platform and poster sessions of the Society of Environmental Toxicology and Chemistry (SETAC) Latin America 14th Biennial Meeting, conducted virtually from 26–29 September 2021. The abstracts are reproduced as accepted by the Scientific Program Committee and appear in numerical order. In each abstract, the presenting author's name is underlined. The author index cross-references the corresponding abstract numbers.

14. Environmental Impact of Mining and Other Industrial Activities

14.01 Analysis of Mine Indicator Metals in the Biomonitor Punctelia Hypoleucites Transplanted to Bajo de la Alumbrera and Nearby Towns, Catamarca, Argentina

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In Bajo de la Alumbrera (open pit mine of Cu, Au and Mo, located in Catamarca, Argentina) and in three nearby towns, studies were carried out with Punctelia hypoleucites (Nyl.) Krog (lichenized Ascomycete), using a transplant technique in order to evaluate the metal content related to the mining activity exposure and thus evaluate the biomonitory accumulation capacity of this species. Lichenic material was collected from a site considered pristine (control site) and distributed in 30 polyester mesh bags, and 3 samples were separated directly as a basal sample. The lichen bags were transplanted to 10 sites: 6 sites inside the mine (E1, E3, E4, E8, E9, E10) and 4 sites outside the company limits in the three nearby towns (E5-Amanao, E6-Los Nacimientos and E7-Hualfín) and the control site (SC). After 3 months of exposure they were transported to the laboratory, where the concentrations of some mine indicator elements (Cu, Fe, Mo, Sr, Pb, Zn, Mn, Cd) were determined by Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES). The ratio between the concentration of each element after exposure and the basal sample (exposed / basal - EC ratio) was used to investigate the lichen accumulation rates, as well as to compare between sites. A 5-class interpretive scale (severe loss, loss, normal, accumulation and severe accumulation) was used based on the deviation of EC ratio from "normal" conditions, which is assumed to be ± 25% from 1. Based on these ratios, severe accumulation of Cu and Mo was observed at the in-mine sites, mainly at E1 and E8. These sites are close to emission point sources (primary material crushing and stock pile sector). Accumulation of Fe, Pb, Zn, Mn and Cd were found in the control site. In addition, Pb and Zn showed severe accumulation only at off-mine sites. Since the higher Cu and Mo content in the in-mine sites corresponds to the geochemical characteristics of the deposit, it could be concluded that this species reflects the composition of the particulate matter generated by the mining operations and, therefore, could be used as a biomonitor of air quality related to open-pit mining.

14.04 An Integrative Approach to Assess the Environmental Impacts of Gold Mining Contamination in the Amazon

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The Amazon basin has been historically threatened by gold mining. As the number of legal and illegal mining sites increase, it is important to develop integrative methods to evaluate the effects of mining pollution on Amazonian freshwater ecosystems. Here, we sampled water and sediments in 11 sites potentially affected by mining activities in the Napo province of Ecuador, which is located in the Andes-Amazonia region. At each sampling site, environmental impacts were evaluated using four lines of evidence (LOEs): water physico-chemical parameters; metal exposure concentrations in water and sediments; macroinvertebrate community response via an index of family tolerances for environmental impacts (AAMBI); and toxicity by conducting bioassays with *Lactuca sativa* and *Daphnia magna*. For water samples, dissolved oxygen and total suspended solids were, in the majority of sites, under (< 80%) and above (>130 mg/Ls) quality standards, respectively. Ag, Al, As, Cd, Cu, Fe, Mn, Pb and Zn were detected above quality standards set by Ecuador, Canada, and the United States. For sediment samples, V, B and Cr concentrations were also above quality standards. Nine out of eleven sampling sites were classified as having bad environmental quality based on the AAMBI score. Ranges of *L. sativa* seed germination in both water (37% to 70%) and sediment (0% to 65%), indicate significant toxicity. For half of the sites, neonates of *D. magna* showed a 50% percent reduction in survival compared to the experimental control. Our integrated LOEs index allowed ranking of sites regarding their environmental degradation. Given the importance of the Andes-Amazon region for biodiversity preservation and ecosystem service provision, we recommend a further control of the mining expansion in the region and its continued environmental impact monitoring using multiple LOEs.

14.06 Evaluation of Soil Pollution Caused by Waste Accumulation From an Abandoned Gold Mine 50 Years Ago in La Planta, San Juan, Argentina

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Metal accumulation is the main soil pollution caused by abandoned gold mines. Metal(loid)s are not biodegradable and have high persistence in the environment. The objective of this study was to evaluate the degree of contamination generated by mining waste in La Planta, San Juan, Argentina. Ten soil samples were randomly taken at two sampling sites: contaminated (S1) and reference sites (S2). A physicochemical characterization was carried out. Total, mobilizable and soluble concentration of Cu, Cd, Zn, and As was determined. The Geoaccumulation Index (Igeo), Contamination Factor (CF) and Contamination Degree (Cdeg) were calculated to know the pollution generated by mining waste. Total concentration of metal(loid)s was contrasted with guideline values for residential and agricultural use (Argentine Law no. 24,051). An acid pH (=3) was recorded for S1 and slightly alkaline pH (=8) was recorded for S2. EC was 8 times higher in S1, reaching a maximum value of 41.2 mS cm^{-1}. Essential nutrients were less concentrated in S1. Total concentration of Cu, Cd, Zn, and As was statistically higher in S1 ($p< 0.001$). The mobilizable and soluble fractions were 7 to 38% of the total metal(loid) concentration in S1. While in S2, the mobilizable fraction was 12 to 38% of the total concentration, and the soluble fraction was not detected. The concentrations of metal(loid)s were below the reference levels for both agricultural and residential use in S2, while they were between 1 and 300 times above the reference levels in S1. The highest concentrations

were obtained for Zn (7123 mg kg^{-1}) and As (6516 mg kg^{-1}) in S1. A positive correlation was obtained between EC and the three fractions of the metal(loid)s in S1 ($R>0.7$; $p< 0.001$). The pH correlated negatively with the total and soluble fraction of As, and the mobilizable fraction of Zn ($R>-0.7$; $p< 0.001$). Igeo reached values higher than 5 for As, Cd and Zn in S1, categorized as *very strong contamination* and Cu corresponds to the category *uncontaminated to moderately contaminated*. Using CF values, S1 was classified as *very high contaminated site* for all four metal(loid)s. Values of Cdeg showed the highest category of contamination. Results indicate that soil is contaminated with at least Cu, Cd, Zn and As in La Planta, showing the need to carry out a remediation plan. We conclude that soil pH should be regulated in order to reduce the bioavailability of metal(loid)s and promote plant growth.

14.07 210Pb Geochronology and Trace Metal Fluxes (Cu, Zn, Pb, Cd, Ni, Fe, Al, V, Mo, As) in the InkaCoya Lake, Atacama Desert Chile

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Distributions of Cu, Zn, Pb, Cd, Ni, Fe, Al, V, Mo, and As were analyzed in a sediment core collected in the InkaCoya Lake, an important mineral region located in the Atacama Desert north of Chile, where data in metal accumulation and accretion rates are very scarce. Depth profiles of metal concentrations were converted to time-based profiles using a 210Pb-derived vertical accretion rate, estimated to be 0.19 cm year-1 on average. Sediments were dated up to 25 cm depth, corresponding to a layer of ca. 105 years old. The historical changes of metal accumulation along the sediment core have shown a moderate enrichment of Cu, Zn, Pb, Cd, Ni, V, and As concentrations at present, of about fourfold the corresponding background concentrations. Chronological trace metal records showed that metal fluxes have increased over the last 60 years, reaching the maximum values at present of 79.5, 48.8, 243.1, 6.2, 25.2, 34.3, and 31.2 (µg.g-1 cm-2 year-1) for Cu, Zn, Pb, Cd, Ni, V and As, respectively. These increments in metal fluxes are likely influenced by the development of mineral-exploited activities since, over this period of time, mineral production activities in the region have had significant development.

14.08 Ascotán and Carcote Salt Flats As Sensors of Humidity Fluctuations and Anthropic Impacts in the Transition Zone of the Andean Altiplano

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The Altiplano-Puna plateau is a climatic transition zone between the Atacama Desert, and the Amazon basin. The salt flats of the Altiplano are hydrogeological and ecological systems highly dependent and sensitive to seasonal, interannual and inter-decadal variations in humidity they may be affected by anthropic activities. We focused on Ascotán and Carcote, two salt flats located to 3,600 m of elevation in Chile, to determinate the relationship between the depositional environments and recent hydrological conditions, which can be used as sensors of the particular climatic conditions of the Altiplano and anthropic activities in these systems (the Ascotán presents a high anthropic disturbance that began in 1994 and the Carcote is an unaltered system up to the present). Results of analysis of sediment properties (mineralogical, geochemical and magnetic) and the water (elemental composition) of the different springs in the salt flats showed that the water and sediments of Ascotán and Carcote salt flats were heterogeneous composition, both intra- and inter-salt flat. The content of saline facies tended to increase in zones furthest from the edge and close to the depocenter of the basin, whose sediments were composed mainly of finer size grains. A significant difference in the magnetic signatures was also observed between the salt flats. The high χfd% values suggest small ferromagnetic particles that have magnetic sizes SP/SD. These small ferromagnetic particles are the result of authigenic processes that occur under wet conditions in the sediments, originated the transformation from detritic origin to Fe-bearing minerals of authigenic origin. The χ values the Ascotán are inversely related with χfd% values, unlike Carcote. The magnetic behavior in the Ascotán salt flat is because of variation in the water table due extraction by mining activity, the Fe-bearing minerals of authigenic origin may be subjected to oxidation processes, reducing χ values. The Fe-bearing minerals of authigenic origin of Carcote did not suffer oxidation. Our results suggest that Ascotán and Carcote salt flats constitute excellent sensors for current environmental conditions and anthropic disturbances which can be used as a sentinel in the understanding with other high Andean environments, in this way to understand the processes that occur in the formation of these systems and to differentiate the external processes that disturb their balance.

14.09 Differentiation of Diatoms Guilds in Extreme Environments From Andean Altiplano

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Near the Andean Altiplano are two salt flats, Carcote and Ascotán, the former almost undisturbed by human intervention, and the latter subjected to historical anthropic intervention by brine-mining. To identify the main factors that promote biotic community differentiation in these salt flats under different levels of human intervention, the aim of this study was to compare both the abundance and the taxonomic diatom community index by guilds present in these salt flat systems, their relationship to environmental conditions, and the potential anthropic impact on their community structures. Diatom guilds were compared between salt flats based on their diversity, species richness, and abundance relative to ionic concentrations and grain size. Beta diversity and the percentages of nestedness and turnover for each guild were also estimated. Results showed significant differences in ecological variables between the two salt flats. The largest values of species abundance, richness, and diatom Shannon diversity index were measured in Carcote (mining activities-free salt flat), suggesting greater primary productivity and diversity. The most abundant guild was high profile, and the greatest diversity and richness were measured for the motile species guild. The results also showed that the species composition of the motile guild was more differentiated between salt flats than other guilds, suggesting that motile diatoms are a key guild in maintaining the diatom community and that species from this guild are more sensitive to local conditions from each salt flat. A more heterogeneous community was observed in Ascotán than Carcote, showing that the mechanisms of maintenance of diversity, as dispersion abilities, were salt flat-dependent. This evidence suggests that the highest diversity could be related to human use, which challenges us to