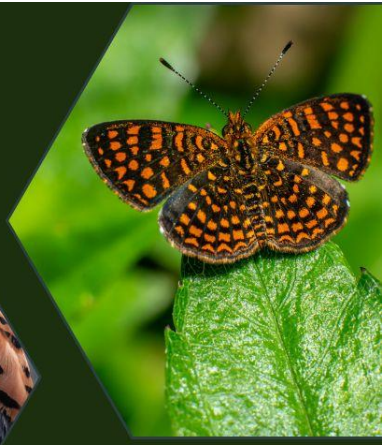


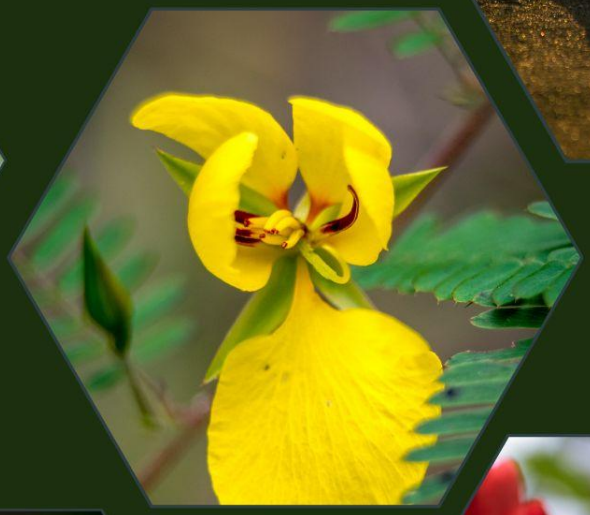


SECAS–PR

Simposio de Ecología y Ciencias Ambientales de Puerto Rico

ABRIL 16 2026





Auspiciadores

SECAs-PR es un evento para todxs en nuestro archipiélago. Para que esto continúe, necesitamos contar con su donativo.

Carta de Bienvenida

16 de abril de 2026

Estimados presentadores, panelistas, científicos, artistas, estudiantes graduados, estudiantes subgraduados y miembros de la comunidad:

Es con gran entusiasmo y profundo orgullo que les damos la más cordial bienvenida al **Simposio de Ecología y Ciencias Ambientales de Puerto Rico**. Este evento representa un paso significativo en nuestro compromiso colectivo con la protección, el entendimiento y la conservación de nuestros recursos naturales, al tiempo que reconoce el papel esencial de las artes y la comunidad en la construcción de una conciencia ambiental más inclusiva y transformadora.

Reunir a investigadores, profesionales, estudiantes, artistas y miembros de la comunidad en un mismo espacio fomenta un diálogo interdisciplinario enriquecedor. La integración de las ciencias, las artes y el conocimiento comunitario nos permite no sólo generar nuevas ideas, sino también conectar emocional y culturalmente con los retos ambientales que enfrentamos en Puerto Rico y a nivel global.

A lo largo de esta jornada de conferencias, paneles, presentaciones y expresiones artísticas, tendremos la oportunidad de explorar una amplia diversidad de temas: desde la conservación de la biodiversidad y el manejo sostenible de nuestros ecosistemas, hasta la justicia ambiental, la resiliencia comunitaria y el poder de las artes como herramienta de educación, comunicación y cambio social.

Deseamos expresar nuestro más sincero agradecimiento a todos los participantes por su compromiso, dedicación y pasión. Sus aportaciones —ya sean científicas, artísticas o comunitarias— son fundamentales para el éxito de este simposio y para el fortalecimiento de una cultura ambiental más consciente, crítica y participativa en Puerto Rico.

Esperamos que esta experiencia sea enriquecedora y significativa, llena de aprendizaje, inspiración y colaboración. Que este simposio sirva como un espacio de encuentro que impulse nuevas alianzas, proyectos interdisciplinarios y acciones concretas en favor de nuestro ambiente y nuestras comunidades.

Una vez más, les damos una calurosa bienvenida y les deseamos un simposio exitoso y transformador.

¡Enhorabuena!

Jonathan Alfredo López Colón, MSEM
Director | Comité Organizador del Simposio de Ecología y Ciencias Ambientales de Puerto Rico

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Resúmenes -Presentaciones en Formato de Afiches

El valor de la ciencia ciudadana para la conservación: El Caso del Huerto, Vivero y Bosque Urbano Comunitario de Capetillo

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Categoría: Ciencias Ambientales-Manejo de recursos naturales

La ciencia ciudadana es una herramienta esencial en el desarrollo de espacios verdes urbanos. Aun con los esfuerzos de la academia para recopilar datos y fomentar la innovación ambiental, el trabajo necesario es riguroso y extenso. Por tal razón, el Huerto, Vivero y Bosque Urbano y Comunitario de Capetillo sirve como modelo para los retos ambientales de nuestro país. Este espacio, fundado en 2008, busca proveer un lugar de sana convivencia para la recreación, la educación ambiental y la sustentabilidad comunitaria. El huerto se desarrolla al recibir a miembros de la comunidad, profesores, estudiantes y voluntarios de variadas disciplinas, quienes ayudan en las labores y son instruidos en prácticas agroecológicas. El área cuenta también con un bosque de enfoque agroforestal donde se siembran árboles nativos y frutales, sirviendo como pulmón y refugio de vida silvestre dentro de la zona urbanizada de Río Piedras. Aunque estas condiciones propician el hábitat de diversas especies, aún es necesario estudiar la cantidad de individuos que residen allí.

Se ha establecido como meta crear una base de datos de la flora y fauna gracias a la ciencia ciudadana. Durante los pasados dos años, se ha realizado el Bioblitz Comunitario de Capetillo. Por doce horas, el segundo sábado de abril, se realizan recorridos guiados por expertos donde voluntarios documentan con sus teléfonos, a través de iNaturalist, la diversidad del bosque y el huerto. En el primer año, 35 voluntarios documentaron 187 especies, lideradas por plantas (103) y artrópodos (33). En la segunda edición, 52 voluntarios reportaron 367 especies, destacando nuevamente plantas (223) y artrópodos (63). Este registro exitoso evidencia la relevancia de integrar a ciudadanos en la recolección de datos. El registro exitoso de la flora y fauna de estos eventos evidencia la relevancia de la integración de ciudadanos en la recolección de datos. Técnicas de recolección de datos mediante ciudadanos con aplicaciones móviles han sido una estrategia exitosa en otros estudios ecológicos, como la utilización de eBird en los Censos de Aves Acuáticas del Caribe o el uso de i-Tree Eco para la identificación de servicios ecosistémicos en bosques.

Tree Species Variation in Belowground Resource Allocation and Uptake

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Categoría: Ciencias Ambientales-Variación de árboles por profundidad de raíces

Belowground resource allocation and uptake in forests are crucial to the carbon cycle, soil health, and plant survival. The fine roots of trees located at the most distal end of the root system drive resource uptake and are a main contributor to belowground carbon pools after decomposition. Deep roots access deeper water and nutrients during stress. Many studies have researched surficial rooting patterns up to 20 cm, but rooting patterns at deeper depths (e.g. -50cm or deeper) are seldom investigated. The overarching question of this research project was: "How does the depth distribution of total fine-root biomass vary among species?" This study investigated rooting depth up to 150 cm and compared root biomass distributions across five mono-dominant plots (Carya ovata, Picea abies, Pinus strobus, Quercus alba, Chamaecyparis pisifera) at the Morton Arboretum in Illinois, United States. We hypothesized that: a) Species with bimodal patterns of root production would be associated with greater total root biomass in comparison with unimodal patterns; b) Soil layers with greater root biomass would have a lower pH than soil layers with less root biomass because of relatively acidic fine roots exudates. Soil was sampled at a depth of 150 cm, sectioned at different depth increments, and classified into categories of absorptive, transportive, coarse, and dead roots. Additionally, pH of the sampled soils was conducted using the slurry method. To determine if there was bimodality in the plots, mode testing was performed using the multimode R package to find notable peaks in the data. Root bimodality was found in three plots: Picea abies, Pinus strobus and Quercus alba. Findings partially support the first hypothesis; two of the three plots that showed bimodality had the largest amount of total root biomass in all plots (Picea abies and Quercus alba). Peaks in root biomass aligned with decreases in pH, which supports the second hypothesis. To better evaluate understanding of the modality of root distributions, future studies should sample from more diverse sets of tree species. Additionally, to determine if roots are the only factor contributing to soil acidity in plots, a future study should measure fine root biomass and indicators of root exudates across the soil profile.

This research was supported by the NSF REU Site Award (No. 2243586): The Morton Arboretum, Center for Tree Science.

Physicochemical Variation Across the San Juan Bay Estuary and Its Implications for Microbiological Pattern

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Categoría: Ciencias Ambientales-Calidad de agua

The San Juan Bay Estuary, located in the metropolitan area of San Juan, Puerto Rico, comprises a network of interconnected coastal water bodies, including San Juan Bay, Martín Peña Channel, San José Lagoon, Suárez Channel, and Piñones Lagoon. In the 1930s, the system was fully navigable, allowing passage between these water bodies. Today, it is no longer navigable due to decades of unregulated urban development, particularly along the Martín Peña Channel. Sediment accumulation has reduced tidal exchange, while sewage discharges have altered physicochemical conditions and increased fecal indicator bacteria beyond U.S. Environmental Protection Agency (USEPA) recreational water quality standards.

This study evaluates the relationship between physicochemical parameters and microbiological indicators in the estuary. Since 2022, monthly water samples have been collected at five stations across the eastern, central, and western sections of the Martín Peña Channel. In situ measurements include dissolved oxygen, salinity, temperature, and pH. Laboratory analyses assess turbidity and enumerate enterococci, Escherichia coli, and fecal coliforms, along with DNA isolation for future molecular analyses.

Results show hypoxic conditions in stations within the Martín Peña Channel and San José Lagoon, while Suárez Channel exhibits higher dissolved oxygen levels. Salinity is highest in SanJosé Lagoon. Turbidity peaks in the central Martín Peña Channel. Concentrations of enterococci, E. coli, and fecal coliforms are significantly elevated in the Martín Peña Channel, consistent with sewage contamination, and all stations exceed EPA recreational limits. Overall, findings indicate a strong association between altered physicochemical conditions and elevated fecal contamination. Ongoing metagenomic analyses aim to characterize microbial communities, identify potential pathogens, and inform restoration and public health strategies. Results will be shared with stakeholders and government agencies to support evidence-based management.

Dinámica en la producción de biomasa del plátano por enmiendas de biocarbón, biopolímeros y micorrizas en un suelo Oxisol

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Categoría: Ciencias Ambientales-Agricultura (Biología de suelos en cultivos de plátanos)

Las prácticas agrícolas convencionales, especialmente la labranza intensiva, han contribuido a la degradación de los suelos tropicales mediante la pérdida de materia orgánica, erosión y disminución de la fertilidad, afectando la actividad microbiana, la disponibilidad de nutrientes y la productividad. En Puerto Rico, el cultivo de plátano es de alta importancia y se desarrolla mayormente en suelos Oxisoles, caracterizados por baja fertilidad, alta acidez y limitada retención de humedad, condiciones que restringen su sostenibilidad. El uso de enmiendas orgánicas y biológicas representa una alternativa para restaurar la funcionalidad del suelo. El objetivo de este estudio fue evaluar el efecto del biocarbón, un biopolímero a base de xantano y micorrizas arbusculares sobre la biomasa del plátano, la actividad fotosintética y el metabolismo microbiano en un Oxisol. El experimento se realizó en invernadero bajo un diseño con cuatro tratamientos: control (C), biocarbón + xantano (BX), biocarbón + xantano + micorrizas (BXM) y micorrizas (M). Se midieron variables de crecimiento y vigor, como altura, desarrollo radicular y contenido de clorofila, además de indicadores biológicos del suelo como respiración microbiana y carbono orgánico total. Los resultados mostraron que las enmiendas mejoraron el desarrollo del cultivo y la calidad biológica del suelo. El tratamiento BXM presentó el mejor desempeño en los indicadores de crecimiento vegetal del cultivo y mejores parámetros de calidad biológica del suelo con incrementos en la respiración microbiana y el carbono orgánico, sugiriendo un efecto sinérgico que favorece el ambiente edáfico y la eficiencia del sistema radicular. En conclusión, la integración de biocarbón, biopolímeros y micorrizas arbusculares constituye una estrategia prometedora para mejorar la calidad del suelo y promover sistemas de producción de plátano más sostenibles en suelos degradados.

Characterization of bacteria associated with *Musa* sp. for the biological control of *Fusarium* sp.

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Categoría: Ciencias Ambientales-Biological control of plant pathogens using plant-associated bacteria

The extensive use of chemical fungicides has had a significant environmental impact, prompting the search for novel biological agents with antifungal potential as a sustainable alternative. *Fusarium* spp. is a widely aggressive fungus, widely distributed, and is mainly responsible for causing wilting and rotting of crops with high economic value or demand. This poses a significant challenge for farmers due to crop losses caused by this fungus. Plantains are among the most important food crops worldwide and are very characteristic here in Puerto Rico due to their nutritional value and high culinary demand. However, the characterization of plant-associated bacteria from *Musa* sp. with antifungal potential remains limited. In this study, we aimed to characterize the bacteria previously isolated from *Musa* sp. Cultivar. This study follows a laboratory-based experimental design. Previously isolated bacteria from *Musa* sp. cultivars were characterized using conventional microbiological methods, including Gram staining, biochemical assays (such as catalase activity and carbohydrate fermentation), microscopy, motility tests, and antagonism assays. Data were analyzed based on phenotypic and biochemical profiles. Additionally, bacterial genomic characterization was performed using the Illumina platform to characterize the isolates and identify genes potentially associated with antifungal activity. Preliminary morphological and biochemical results classify both isolates as catalase-positive, Gram-positive, and negative short bacilli, with similar sugar fermentation profiles observed. The antagonistic assay between isolates and *Fusarium* sp. showed no inhibition but slower growth. Regarding the motility test, none of the above isolates were motile. Genomic characterization revealed genes associated with plant pathogen suppression and growth-promoting. This study highlights the potential of plant-associated bacteria as sustainable biocontrol agents against fungal pathogens. These findings provide a new perspective on environmentally friendly strategies to mitigate fungal infections in important food crops such as plantains. Integrating genomic analysis enhances the identification of genes involved in antifungal activity and provides insight into the molecular mechanisms underlying bacterial antagonism. Overall, this study provides insight into plant-bacteria associations and potential biocontrol strategies.

We extend our gratitude to the Inter-American University of Puerto Rico, Barranquitas Campus, and the United States Department of Education, Developing Hispanic-Serving Institutions Programs (DHSI) Title V: Award No. P031S220125

Triple C: Colegiales contra la contaminación

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Categoría: Ciencias Ambientales-Sostenibilidad y contaminación

Colegiales Contra la Contaminación es una asociación estudiantil del Recinto Universitario de Mayagüez (RUM) dedicada a promover la sostenibilidad ambiental mediante un enfoque integral que combina educación, acción práctica, incidencia política e investigación. Su estructura organizativa se basa en comités activos que atienden distintas dimensiones del problema ambiental: la Casita Ecosolar funciona como un espacio demostrativo y educativo sobre energías renovables y prácticas sostenibles; el Comité de Residuos Sólidos se encarga del manejo de reciclaje y desperdicios, así como de la concienciación sobre reducción y consumo responsable; y el Comité de Formación Política Ambiental trabaja la educación cívica y la participación en procesos de política pública, incluyendo el desarrollo de propuestas y proyectos de ley. Además de implementar soluciones concretas, Triple C integra un componente investigativo orientado a evaluar el estado actual del recinto en términos de sostenibilidad y manejo de residuos, identificando áreas de mejora y generando información que respalde la toma de decisiones. En conjunto, la organización busca transformar el RUM en un modelo de sostenibilidad y extender su impacto hacia las comunidades en Puerto Rico, articulando esfuerzos educativos, operativos y analíticos.

Optimización de la extracción de ADN genómico de alto peso molecular en *Phlebotaenia cowellii* Britton

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Categoría: Ciencias Ambientales-Secuenciación ADN genómico plantas

El *Phlebotaenia cowellii* Britton (árbol de violeta), es una especie endémica y rara de Puerto Rico catalogada en peligro crítico debido a su distribución restringida y alta vulnerabilidad ecológica (Kearney et al., 2019; Kew Science, 2024). El objetivo de esta investigación es, optimizar un protocolo de extracción de ADN genómico (ADNg) de alto peso molecular a partir de tejido foliar de P. cowellii para el ensamblaje genómico de novo del árbol. El procedimiento inicia con el aislamiento de núcleos de hojas jóvenes apicales de un individuo adulto en el Bosque Seco de Guánica. Las condiciones y pasos críticos para el aislamiento de núcleos según Workman, 2018 fueron: la calidad del tejido vegetal, la calidad del agua utilizada en las soluciones, y la repetición de lavados con el amortiguador de aislamiento nuclear para la eliminación de la clorofila. Los núcleos aislados fueron almacenados a -80 °C para su siguiente paso la extracción de ADNg. Se optimizó el procedimiento del "Wizard® HMW DNA Extraction Kit" como la lisis celular, los tiempos de incubación y centrifugaciones; con el objetivo de maximizar la solubilidad y la obtención de una alta concentración de ADNg. La calidad y cantidad del ADNg fueron determinadas mediante espectrofotometría UV (UV5Nano, Mettler Toledo™), y la integridad del ADNg fue confirmada mediante electroforesis en gel. Con el ADNg de alto peso molecular obtenido se prepararán librerías para su secuenciación mediante la tecnología de nanoporos en la plataforma "Oxford Nanopore Technology®". Este estudio proveerá una metodología para estudios genómicos en especies vegetales y contribuye a los esfuerzos de conservación genética de especies raras y endémicas de Puerto Rico.

The influence of the flavor of expanded polystyrene on ingestion and biodegradation by *Tenebrio molitor*

Claudia S. Santiago Jiménez[1], Victor E. Reyes Feliciano[1], Coralis N. Sánchez Rivera[1], Adriana V. Rodriguez Acosta[1]

Categoría: Ciencias Ambientales-Biodegradación de plásticos bajo diferentes tratamientos dietéticos

Plastic pollution is one of the most important environmental problems worldwide. Expanded polystyrene (EPS), commonly known as foam plastic or Styrofoam, is particularly persistent in the environment because it degrades very slowly. Recent studies have shown that mealworm larvae (Tenebrio molitor) are capable of consuming EPS, suggesting a potential biological approach to reducing plastic waste. However, most previous research has focused on describing this ability rather than exploring ways to improve the efficiency of plastic consumption. This study evaluated whether adding natural foods to EPS could increase the ability of mealworm larvae to consume plastic. Three experimental treatments were compared: EPS alone (control), EPS with apple puree, and EPS with carrot puree. All groups received raw potato as a source of moisture. Larval body mass, EPS consumption, and survival were monitored weekly under standardized conditions. The results showed that the addition of natural foods influenced the consumption of EPS. Larvae in the apple puree treatment showed more stable and sustained plastic consumption and greater body mass gain. The carrot treatment produced a faster initial consumption response, but less consistent results over time. The control group showed the lowest levels of plastic consumption and growth. Survival remained high in all treatments. The results suggest that simple dietary additions can improve the efficiency of EPS consumption by Tenebrio molitor. These findings highlight the potential of environmentally responsible strategies based on system design to improve biological approaches for reducing plastic waste.

Land Use and Land Cover Changes in Northeastern Puerto Rico: Impacts of Military Land Use in Natural Protected Areas

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Categoría: Ciencias Ambientales-Sistemas de Información Geográfica (GIS)

Different land cover types determine habitat availability, biodiversity, and the overall functioning of the ecosystem. Changes in land cover might fragment habitats, alter species distributions, and reduce ecosystem resilience. In tropical coastal areas, mangroves, wetlands, and forests provide critical ecosystem services, such as water filtration and nutrient cycling. Land use patterns influence infrastructure development, environmental sustainability, and overall human societies. Monitoring land cover and land use changes helps plan sustainable development, manage protected areas, and mitigate human pressures on these ecosystems by detecting deforestation and forest regeneration, wetland degradation and recovery, urban development, and the effectiveness of land management policy. This is particularly true for places like Roosevelt Roads Naval Station (RRNS) in Northeastern Puerto Rico, as its establishment restricted public access, creating unique land uses that had an impact in current land cover and conservation potential. RRNS was closed after 60 years of military operation, and, approximately, 45% of the natural areas were transferred to the Puerto Rico Department of Natural and Environmental Resources (PRDNER). Co-managed with the Puerto Rico Conservation Trust, these natural areas were designated as the Medio and Daguao Natural Protected Area. This designation makes the area an ideal space to evaluate long-term land use and land cover changes. Since the closure of RRNS, the region has undergone rapid transitions associated with shifts from military use to conservation. Therefore, this project aims to conduct a multi-temporal land use and land cover change analysis within the Medio Mundo and Daguao Natural Protected Area, with the purpose of identifying spatial and temporal patterns associated with military activity and post-closure conservation efforts. Using Geographic Information Systems (GIS) and Remote Sensing techniques, such as historical aerial imagery and Landsat satellite imagery, combined with supervised land cover classification methods, this study is expected to reveal patterns of recovery within the coastal ecosystems of Medio Mundo and Daguao. Results will contribute to the understanding of how past land use influences current and future ecosystem dynamics.

Assessing the Anticancer Potential of Coffee Leaf Extract Against Colorectal Cancer Cells

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Categoría: Ciencias Ambientales-Toxicología

Coffee is one of the most widely consumed beverages in the Caribbean and represents an important source of bioactive compounds with potential therapeutic properties. The growing recognition of these compounds highlights coffee as a promising candidate for the development of novel therapeutic strategies targeting aggressive malignancies such as colorectal cancer. In this study, we evaluated the cytotoxic potential of ethanolic solvent-based coffee leaf extracts against HCT-116 and HT-29 colorectal cancer cell lines. Additionally, total polyphenolic and flavonoid contents were quantified to assess their potential contribution to anticancer activity. The results demonstrated that ethanolic coffee leaf extracts exhibited strong antiproliferative activity, significantly reducing cell viability in both cell lines at 24 and 48 hours. Phytochemical analysis confirmed the presence of phenolic and flavonoid compounds. These findings highlight the potential contribution of phenolic and flavonoid compounds present in coffee leaves as bioactive agents with anticancer properties. Coffee leaf extracts may represent a promising source for phytomedicine development. However, further studies are necessary to elucidate the underlying molecular mechanisms and to confirm their efficacy through detailed analysis of the cellular pathways involved in cytotoxicity.

Evidence for Microplastic Ingestion in Bats from Puerto Rico

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Categoría: Ciencias Ambientales-Toxicología

Microplastic pollution has emerged as a widespread environmental concern, yet their presence and potential impacts on terrestrial vertebrates remain poorly understood. Bats, as highly mobile insectivorous mammals, may be exposed to microplastics indirectly through the consumption of contaminated prey or through environmental contact. Despite their ecological importance as biomarkers, there is limited documentation of microplastic ingestion in bat species. This study evaluated the presence of microplastics in the stomach contents of bats collected in Puerto Rico. Specimens consisted of individuals found dead in caves or those that died accidentally and were opportunistically recovered. Laboratory processing included chemical digestion to remove organic matter, followed by filtration and ultraviolet light examination to facilitate particle detection. Microplastics were detected in several specimens, including fragments and fibers corresponding to different types of synthetic polymers. The presence of these materials suggests that bats may be exposed to microplastics through trophic transfer or environmental contamination within their foraging habitats. Although ingestion varied among individuals, the detection of multiple plastic types highlights the pervasive nature of plastic pollution even in organisms occupying aerial and subterranean environments. These findings contribute to the growing body of evidence documenting microplastic contamination across diverse ecosystems and taxa. Further research is needed to better understand exposure pathways and the potential ecological impacts of microplastic ingestion on bat populations.

Calling traits of the *Eleutherodactylus wightmanae* frog at three geographically distinct locations across the main island of Puerto Rico

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Categoría: Ecología-Biología de la conservación

This study evaluates the effects of body size and geographic location on the calling traits of male Melodious Coqui (Eleutherodactylus wightmanae) within its current distributional range. Three forests were selected for the comparison: Cayey, Toro Negro, and Maricao, each seasonally. A note-centred approach was used in the analysis. Frogs recorded during the cold-dry season were larger, and, when compared across sites, those recorded in Maricao were the smallest among forests. Body size influenced calling traits: a moderate effect on the duration and note repetition rate of type-2 notes and a slight variation of the note's intensity and peak frequency. Among populations, frogs from Toro Negro had a longer call duration, the lowest peak frequency of notes, and the highest intensity of type-2 notes. In contrast, the highest repetition rate of type-2 notes was in frogs from Cayey. The seasonal changes in temperature and humidity appeared to influence the rate of note repetition in the calls and their intensity. Furthermore, seasonal differences in type-2 note intensity were evident across the Maricao and Cayey populations, with those from Maricao exhibiting the highest intensity during the cold-dry season. These differences in calling traits among populations could result from local adaptations. Because of the endangered status of Eleutherodactylus wightmanae as well as being endemic to Puerto Rico, the study opens the question of whether the variation in calling behavior traits across populations could be a sign of reduced fitness of individuals or a response to the local population's density.

Integration of Citizen Science and Academic Projects to Document Puerto Rico Biodiversity Using iNaturalist (2020–2025)

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Categoría: Ecología-Biología de la conservación

Citizen-science platforms support biodiversity documentation through photographic evidence, standardized metadata, and community validation, while their integration into university courses strengthens biological records and practical learning. In Puerto Rico, iNaturalist has been used in courses, laboratories, and academic BioBlitzes; however, its contribution through university projects has not been systematically quantified. This study aimed to: (1) quantify observations, species, and observers from 25 university projects (2020–2025) and compare them with Puerto Rico's record; (2) evaluate observation quality (Research Grade, Needs ID, Casual) and municipal distribution; (3) describe taxonomic distribution by kingdoms, phyla, and orders; and (4) identify species recorded for the first time for Puerto Rico within iNaturalist and their biogeographic status. Project observations were downloaded and integrated into a combined database. Research Grade observations were used for quantitative analyses of richness, municipality distribution, and taxonomic composition. Observation patterns were visualized with choropleth maps, and first records were manually verified in iNaturalist's chronological history. The 25 projects generated 45,773 observations, representing 12.65% of all iNaturalist observations for Puerto Rico. Of these, 17,962 reached Research Grade, equivalent to 39.4% of the project total and 7.74% of all validated observations for Puerto Rico. A total of 729 observers contributed, representing 4.8% of iNaturalist observers in Puerto Rico. The projects documented 4,831 species, including 1,756 Research Grade species, equivalent to 31.9% of Puerto Rico's validated iNaturalist species.

Taxonomic distribution was dominated by Animalia and Plantae, followed by Fungi. Within Animalia, the dominant phyla were Chordata, Arthropoda, and Mollusca. Plant records were dominated by Tracheophyta, and fungal records were mainly Basidiomycota. Highest richness occurred in Cayey, San Juan, Caguas, Gurabo, and Patillas. We identified 170 species recorded for the first time for Puerto Rico within the iNaturalist platform. University projects using iNaturalist make substantial contributions to Puerto Rico's biodiversity record and provide evidence to improve future geographic and taxonomic representativeness.

Media Framing of Snakes in Puerto Rico: A Content Analysis of Digital and Audiovisual News

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Categoría: Ecología-Biología de la Conservación

Snakes have long been associated with negative meanings across historical, mythological, and religious narratives. In modern times, cinema, television, social media, and the press, among other forms of media, have played a significant role in fostering and reinforcing various prejudices against this group of animals. Such portrayals can influence public perception and can hinder efforts toward the conservation, preservation, and protection of these species when they are perceived as risks to human safety. This study examines how snakes are portrayed in Puerto Rican media through a quantitative content analysis of both digital news and audiovisual news coverage. A corpus of articles from the Puerto Rican press referencing snakes was compiled, and three artificial intelligence tools were employed to identify and quantify words associated with "peligro," "amenaza," and "impacto ecológico." The frequency of these words in the responses generated by all tools was compared, revealing trends and patterns in the narratives used. Results indicate that terms like "peligro," "ataque," "invasora," and "muerte" appeared frequently in both written and audiovisual media, suggesting a consistently negative framing of snakes. These findings highlight how media narratives could have significant repercussions for the conservation of endemic species, such as the Puerto Rican boa (Chilabothrus inornatus). Future research will expand the dataset and compare media representations of snakes with those of more charismatic species.

Monitoreo de calidad del agua en el río del campus de la Universidad de Puerto Rico en Cayey utilizando parámetros fisicoquímicos y macroinvertebrados como bioindicadores.

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Categoría: Ecología-Biología de la conservación

Monitorear la calidad del agua es fundamental para poder mantener la biodiversidad y el equilibrio ambiental de los ecosistemas acuáticos. Sin embargo, cambios ambientales y actividades humanas son factores que pueden afectar la calidad del agua y la vida que habita en estos sistemas. Uno de los métodos que se puede utilizar para evaluar las condiciones de los cuerpos de agua es mediante el uso de macroinvertebrados acuáticos como bioindicadores. La presencia de estos organismos puede reflejar las condiciones ambientales del agua, ya que algunos grupos responden de manera distinta a los cambios ambientales. El objetivo de este estudio es analizar la calidad del agua del río ubicado en el campus de la Universidad de Puerto Rico en Cayey mediante la identificación de macroinvertebrados y la medición de parámetros físico-químicos del agua. Durante el muestreo se recolectaron organismos del río y se registraron variables ambientales como la temperatura (27.3 – 30.3 ºC), pH (7.8 – 8.4) y conductividad (641-1083 µS/cm). Las muestras fueron llevadas al laboratorio en el que se lleva a cabo la separación e identificación de los macroinvertebrados acuáticos. Estos organismos se encuentran actualmente en proceso de identificación hasta nivel de orden y familia, lo que permitirá determinar con mayor precisión las condiciones ecológicas del río. Resultados preliminares muestran la presencia de diferentes grupos de macroinvertebrados que pertenecen a varios ordenes de insectos acuáticos, incluyendo Ephemeroptera, Lepidoptera, Hemiptera y Diptera. Entre las familias identificadas se encuentran Veliidae, Crambidae, Leptophlebiidae y Chironomidae Se espera que con el estudio de estos organismos se pueda comprender las condiciones del rio y la calidad del agua, aportando información útil para el monitoreo ambiental y manejo sostenible de los recursos de agua dulce.

Smurf Bees: An assay to determine intestinal integrity as a measure of health decline with age or other factors in honey bees (*Apis mellifera*)

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Categoría: Ecología-Ecología animal

Aging affects overall health, including gut integrity. Intestinal permeability, the passage of materials from the gut lumen into circulation due to epithelial damage, is observed with reduced gut integrity in various species. The Smurf Assay (SA), developed in Drosophila melanogaster, assesses gut integrity using non-absorbable blue dye. In healthy individuals, the dye remains in the gut, but in compromised individuals, it spreads throughout the body, indicating reduced gut health and proximity to death. We adapted SA to Apis mellifera to assess gut integrity changes due to age or stressors. First, we tested dye toxicity in forager bees at 0%, 0.1%, 0.5%, and 2% dye concentrations in 2 m (molal) sucrose. With 40–50 bees per box, survival probability and Smurf phenotype frequency were recorded over eight days. Smurf bees appeared in <1% of cases after 24 hours. Mortality did not increase in blue-fed bees for the first four days but rose thereafter, correlating with age. When paraquat, an oxidative stressor, was added, Smurf frequency and mortality increased with paraquat dose. This study is the first to adapt SA in bees, demonstrating its effectiveness in assessing gut permeability, similar to other species. We discuss the significance of increased Smurf phenotype frequency with age and stress exposure.

Assessing Potential Predation Pressure on *Pholidoscelis wetmorei* (Puerto Rican Blue-tailed Ground Lizard) in the Guánica Dry Forest, Puerto Rico

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Categoría: Ecología-Ecología animal

Pholidoscelis wetmorei is a ground-dwelling lizard endemic to the dry forests and coastal habitats of southwestern Puerto Rico and nearby islands. This species occupies open and semi-arid environments where it actively forages on the forest floor, potentially exposing it to a variety of terrestrial predators. Despite its ecological presence in these habitats, little is known about the predation pressures that may influence its populations, particularly in landscapes increasingly affected by human activity and invasive species. To evaluate potential predation risk, we deployed camera traps alongside realistic models of *P. wetmorei* along an anthropogenic gradient in Guánica State Forest, Puerto Rico. Sampling sites extended from coastal areas to interior forest habitats to document predator interactions and identify species responding to the models. Camera trap records revealed multiple encounters with invasive mammalian predators. The most frequently detected species reacting to the models were small Indian mongooses (*Herpestes auropunctatus*), feral cats (*Felis catus*), and free-ranging dogs (Canis familiaris). All three species are wellestablished invasive predators in Puerto Rico and are known to negatively impact native wildlife. These observations suggest that invasive mammals may represent a significant predation risk for *P. wetmorei* within the Guánica landscape. Our findings highlight the importance of monitoring invasive predator activity and incorporating predator management strategies into conservation efforts aimed at protecting native reptile populations in Puerto Rico's dry forest ecosystems.

Clorox Toxicity in Early Stages of Development of the Frog *Osteopilus septentrionalis*

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Categoría: Ecología-Ecología animal

In Puerto Rico, reports of usage of disinfectant to reduce frog vocalization have raised concerns about the unintended ecological consequences of chemical contaminants on local amphibian populations and aquatic environments. Amphibians serve as bioindicators of environmental health due to their permeable skin. The Cuban treefrog *Osteopilus septentrionalis* is an invasive species in Puerto Rico, so it serves as a model for other endemic species specially the ones that are in danger of extinction. Sodium hypochlorite is an active disinfecting ingredient used in commercial bleaches, and it is known for being very toxic to aquatic life. This research will provide information on the sensitivity of tadpoles to bleaches present in their environment. The aim of this study is to determine the effects of different Clorox concentrations on the larval stage growth of O. septentrionalis. The tadpoles were exposed to the concentrations 0, 1.20, 1.25, 1.75 and 1.90 mg/L of Clorox. Two independent trials were conducted under controlled laboratory conditions. Trial 1 included 35 individuals across seven replicates, whereas Trial 2 included 10 individuals across two replicates. Length and weight were measured at each solution renewal, and survival was monitored daily throughout the experimental period. It was observed that as bleach concentrations and exposure duration increase, mortality also increases. Although greater variability in weight was observed at higher concentrations, non-parametric tests demonstrated no significant differences in length or weight between treatments ($p > 0.05$). This suggests that the main effect of the bleach was on survival rather than the tadpole's growth.

Use of spirulina as food for tilapia

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Categoría: Ecología animal

This research evaluated the potential of the locally cultivated and processed microalga Spirulina platensis as an alternative ingredient in the diet of tilapia (Oreochromis niloticus), with the aim of reducing dependence on commercial feeds. A protocol was established and implemented for the collection, open-air drying, and processing (two-stage grinding: blender and mortar) of the algal biomass, yielding a fine-textured, deep green flour. The project successfully completed the initial production phase of the feed ingredient, identified key experts in aquaculture nutrition, and established the methodological foundation for the subsequent formulation of experimental diets. Preliminary results confirmed the technical feasibility of Spirulina processing and highlighted the importance of natural drying to preserve product quality. The project is now ready to advance to the biological experimentation phase, where the effect of the microalga flour on growth and survival parameters in tilapia fry will be evaluated.

Ecology of *Eleutherodactylus richmondistejneger* 1904 (coqui de richmond): conservation implications from in-situ and ex-situ research strategies

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Categoría: Ecología-Ecología animal

Eleutherodactylus richmondi is an endemic terrestrial amphibian of Puerto Rico currently classified as endangered by the IUCN Red List of Threatened Species, with a restricted distribution primarily in mid to high elevation forests. Historical land use changes have likely contributed to its reduced range, yet critical aspects of its reproductive biology and population dynamics are still not very well understood. This study aims to develop methods for in situ and ex situ studies of the reproductive biology and population dynamics of E. richmondi. Fieldwork will be conducted in the vicinity of El Toro Trail at El Yunque National Forest, where monthly visual and acoustic surveys will be used to estimate adult and juvenile abundance and assess habitat use. Additionally, reproductive activity will be monitored using structured quadrants to detect egg clutches and potential parental care, alongside climatic data collection to evaluate seasonal patterns. Additionally, ex situ breeding models in controlled laboratory conditions will be developed, allowing for the observation of reproductive behaviour, egg clutch development, and growth rates. Expected results will include identifying seasonal trends in population structure and reproduction, as well as establishing viable protocols for captive breeding of this and other ground-dwelling frog species. This research will provide essential ecological information for E. richmondi and contribute to the development of conservation strategies for terrestrial amphibians with similar life histories, supporting long-term management and restoration efforts in Puerto Rico.

Monitoring Invasive Species in Urban Forests: A Comparative Analysis of Protected Areas in Puerto Rico

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Categoría: Ecología-Ecología de especies invasoras

Urban forests play a crucial role in providing a wide range of ecosystem services, particularly as refuges for native, endemic, and migratory fauna. However, the presence of invasive species can pose significant threats to these habitats, especially in tropical regions with high levels of human activity, such as Puerto Rico. This study analyzes and compares the composition of native and invasive species across urban forests, including Julio Enrique Monagas (Bayamón), El Nuevo Milenio (San Juan), San Patricio (Guaynabo), and Doña Inés Mendoza (San Juan). Camera trap transects were established along gradients of anthropogenic activity to assess species presence and distribution. Kruskal–Wallis tests were used to evaluate differences among sites, and biodiversity was assessed using Shannon and Simpson diversity indices. Results indicate that El Nuevo Milenio exhibited the highest overall diversity, despite having the lowest number of detections (53 exotic vertebrate records across six species). This site showed the highest Shannon (H’ = 1.88) and Simpson (D = 0.785) indices, suggesting greater species richness and evenness. In contrast, when focusing specifically on invasive species, Julio Enrique Monagas exhibited higher diversity values (Shannon H’ = 1.17; Simpson D = 0.650), indicating a greater diversity of invasive taxa. Additionally, Doña Inés Mendoza Forest appears to be in a more advanced stage of biological invasion relative to the other sites. These findings highlight the importance of monitoring invasive species within urban forests, as such efforts are essential for informing conservation strategies and improving ecological management in highly urbanized tropical landscapes.

Evolutionary imbalance in the naturalization success of alien plants across Mediterranean ecoregions

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Categoría: Ecología-Ecología de especies invasoras

Invasive alien plants drive negative ecological and economic impacts within introduced regions, reshaping biodiversity globally. While anthropogenic factors drive species introductions, the characteristics of invaders, shaped by their evolutionary histories, will interact with ecological conditions to mediate invasion success. The Evolutionary Imbalance Hypothesis (EIH) states that potential invaders will present success if they originate from regions that are 1) large, with abundant populations driving effective selection, and 2) biodiverse, where intense biotic interactions must be overcome for survival. Global analyses provide broad support for the EIH, with successful aliens often originating from native ranges spanning multiple continents that overlap biodiverse regions. However, each continent is composed of diverse biomes, with each biome recurring globally as fragments distributed across continents. Focusing on the exchange of alien species between biome fragments thus presents a more precise analytical framework for testing the EIH. Here, we focus on the exchange of naturalized aliens among Mediterranean biomes, which are characterized by distinct climate and boasting uniquely adapted species, occurring as fragments varying in size and biodiversity across five continents. We identified native species unique to each Mediterranean region using Plants of the World Online and characterized their occurrences as naturalized aliens using the Global Naturalized Alien Flora dataset. Preliminary results indicate support for the second prediction of the EIH, with the small but ultra-diverse Fynbos of Southern Africa overrepresented in the naturalized alien floras in other Mediterranean regions. Our results support the idea that conditions in native distributions can preadapt species for success as invaders.

Feeding Ecology of Naturalized Species of Anurans in Puerto Rico

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Categoría: Ecología-Ecología de especies invasoras

Puerto Rico's amphibian assemblage is composed of various species, mostly of the Eleutherodactylus genus. Of the other species of amphibians present, most are often referred to with the term invasive by other scientists and infer competition, niche displacement over endemic species. However, studies on dietary overlap on these species are lacking in Puerto Rico and insular context in general. With this study I intend to document the diet of naturalized 2 types of species of anurans, compared to published records in the herpetological literature from Caribbean islands, and examine the influence of habitat types on the composition and abundance of prey items in their diets in the current landscape of Puerto Rico. Diet variation in function of habitat type and species' ecology will also be examined, including composition and abundance of prey item types. This will be the first broad-taxonomic study on the diet of naturalized species of anurans in Puerto Rico. This study will help address the potential role of these species as predators of native species. I expect to find sympatric species having diet overlap with prey items. This proposal will provide valuable insight into the amphibian assemblage ecology and their roles as predators.

Isolation and Identification of Antibiotic-Resistant Bacteria from the Skin of the Invasive Cane Toad (*Rhinella marina*)

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Categoría: Ecología-Ecología microbiana

The increasing emergence of antibiotic-resistant bacteria in both clinical and environmental settings poses a significant threat to public health (Salam et al., 2023). Amphibians, particularly invasive species like Rhinella marina, may serve as reservoirs for bacteria harboring antimicrobial resistance (AMR) (Li et al., 2023). The cane toad (Rhinella marina) is an invasive species introduced to Puerto Rico since the 1920s, threatening local biodiversity by rapidly adapting to different ecosystems. This research aims to study antimicrobial resistance in skin-associated bacterial isolates from invasive cane toad (Rhinella marina) populations. Sampling was conducted in the municipality of Naranjito, Puerto Rico. Naranjito is characterized by humid subtropical conditions, forested highlands, and freshwater systems that support dense amphibian populations. Such environments provide ideal conditions for amphibians and their associated microbial communities. A total of ten individuals were sampled using sterile swabs on the skin glands and later plated on Mannitol Salt Agar (MSA) for cultivation and isolation of Staphylococcus aureus. Plates were incubated at 37°C and monitored for 4–6 days. Once pure colonies were obtained through subculturing and subsequently characterized using Gram staining and biochemical tests such as coagulase tests; antibiotic disk trials commenced. Antimicrobial resistance was determined by measuring inhibition zone diameters in disk diffusion according to standardized interpretive criteria. Antibiotics testing including azithromycin, chloramphenicol, imipenem, amoxicillin, tetracycline, clindamycin, cefoxitin, ampicillin, gentamicin, and ceftazidime-clavulanic acid. Preliminary results reveal substantial variability in inhibition zone diameters among isolates, suggesting resistance phenotypes within the amphibian-associated microbiota. These findings indicate that invasive amphibians may harbor diverse bacterial strains with differential resistance capacities. This will contribute to a better understanding of the role of amphibians in the ecology of antibiotic resistance and may reveal novel environmental bacterial strains with clinically relevant resistance profiles.

Historical patterns of functional diversity across an urbanization gradient in northeastern Puerto Rico.

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Categoría: Ecología-Ecología urbana

Urbanization is a challenge that many organisms are currently facing, with complex effects on both native and non-native species. Through fundamentally restructuring landscapes and altering resource dynamics, urbanization leads to a loss of biodiversity and homogenization of wildlife. However, species responses to urbanization can be complex, with negative responses for many species but benefits for others. Thus, a more mechanistic understanding of species responses to urbanization is of increasing conservation priority. Using a trait-based approach, we explore changes in functional diversity across an urbanization gradient in northeastern Puerto Rico, first sampled in 2005 and currently being resampled. By characterizing species within trait spaces across an urbanization gradient, we aim to test whether the composition of functional traits varies predictably with the degree of urbanization. To do so, we will integrate historical and present-day point counts with trait databases. We expect that each habitat type (urban, suburban, exurban, and forest) will have distinct patterns of trait space filling. Here, I will present the baseline patterns of trait space filling for historical sampling of an urbanization gradient. Because of habitat heterogeneity, which allows for the co-occurrence of urban generalist and forest specialists, we expect that suburban and exurban habitats will show a more diverse trait space, whereas urban habitats will show lower diversity due to the abundance of generalist species, although the presence of exotic species might increase the functional diversity. Because endemic species in Puerto Rico are generally tied to the forest, they will maintain moderate-high levels of functional diversity in forested ecosystems. These preliminary patterns of trait space filling serve as a baseline to assess whether functional diversity across a gradient in urbanization, which is currently being sampled, has shifted in the last 20 years. This work is supported by the David S. Lee Fund for the protection of Caribbean Birds.

Huella química de especies dominantes del dosel en bosques serpentiníticos del Cerro Las Mesas, Puerto Rico

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Categoría: Ecología-Ecología vegetal.

Los suelos serpentínicos se caracterizan por altas concentraciones de metales pesados y bajos niveles de nutrientes esenciales, lo cual influye en el crecimiento y la química de las plantas. Poco se conoce sobre la relación de la química foliar de las especies arbóreas que componen estas comunidades con la variación en las propiedades físicas y químicas de suelos serpentíniticos y esto puede revelar distintas adaptaciones. Más aún, en Puerto Rico, la deforestación, uso agrícola y abandono ha redundado en el establecimiento de ecosistemas noveles sobre serpentina y no se conoce cómo las especies introducidas que los dominan se adaptan a suelos serpentínicos. En este estudio, analizamos las concentraciones de nutrientes y metales pesados en especies dominantes del dosel en bosques históricos y novedosos sobre serpentinita en el Cerro Las Mesas, identificamos posibles especies hiperacumuladoras y exploramos la relación entre la química del dosel y suelo. Muestreamos hojas de dosel de especies de árboles dominantes en parcelas circulares de 250 m2, y muestreamos el suelo en cada parcela a tres profundidades: horizonte orgánico (HO) de 0-15 cm y de 15-30 cm. Las muestras fueron analizadas químicamente para determinar concentraciones de macroelementos, microelementos y metales pesados. Usamos ionomas, análisis de clúster (CLA) y correlaciones Spearman para evaluar correspondencias entre concentraciones químicas de dosel y suelo. Los ionomas de individuos de una misma especie fueron similares, independientemente de si se encontraban en parcelas de bosque histórico o novedoso. Las concentraciones de microelementos foliares fueron las que más contribuyeron a la diferenciación entre especies. Entre los metales pesados, la concentración de níquel fue la que más diferencias mostró entre individuos. Sin embargo, la correlación entre las concentraciones de dosel y de las distintas profundidades de suelo fueron débiles para Ni ($\rho = 0.35$ en HO; $\rho = 0.32$ en 0–15 cm; $\rho = 0.27$ en 15–30 cm), para Zn ($\rho = 0.32$ en HO) y fueron más robustas para P en las capas minerales ($\rho = 0.42$ en 0–15 cm; $\rho = 0.29$ en 15–30 cm). Identificamos una especie como posible hiperacumuladora, Tabebuia haemantha, en rodales de bosque histórico. Nuestros resultados indican que la química foliar depende más de la identidad de la especie, independientemente de si es nativa o introducida, que de la variación en composición química que puede haber entre suelos serpentínicos a nivel de paisaje.

Este trabajo fue financiado por el National Institute of Food and Agriculture del US Department of Agriculture mediante fondos McIntire-Stennis (MS-026) otorgados a la Estación Experimental Agrícola (EEA), Universidad de Puerto Rico.

Predicción de la idoneidad del hábitat para el sapo concho puertorriqueño (*Peltophryne lemur* Cope, 1869): un enfoque comparativo de modelización que integra pronósticos ecológicos y espaciales.

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Categoría: Ecología-Modelaje

Evaluamos la idoneidad del hábitat y la distribución potencial del sapo concho puertorriqueño (*Peltophryne lemur),* en peligro de extinción en Puerto Rico mediante modelos de distribución de especies para apoyar la planificación de la conservación y las estrategias de reintroducción. Se aplicaron cuatro técnicas de modelado: Modelos Lineales Generalizados Bayesianos (Bayes GLM), Modelos Aditivos Generalizados (GAM), Modelos de "Random Forest" (RF) y Support Vector Machine (SVM), utilizando datos de presencia provenientes de 18 lugares de estudio, incluyendo poblaciones extirpadas, naturales y reintroducidas. Los predictores ambientales se seleccionaron mediante una clasificación basada en el AIC e incluyeron elevación, cobertura del suelo y dos variables bioclimáticas (precipitación del mes más húmedo y del trimestre más húmedo). El desempeño de los modelos se evaluó mediante el área bajo la curva de la característica operativa del receptor (AUC). El modelo de Bosques Aleatorios demostró la mayor precisión (AUC = 0.919), seguido por GAM (0.853), Bayes GLM (0.823) y SVM (0.814). Todos los modelos identificaron de manera consistente áreas de alta idoneidad en la región kárstica del sur (Guánica–Guayanilla), con posible expansión en el karso del noroeste. Las variables de precipitación y la cobertura del suelo emergieron como los predictores más influyentes. Nuestros hallazgos revelan que el hábitat adecuado para P. lemur es altamente restringido y depende de humedales efímeros y de condiciones hidroclimáticas dentro de paisajes kársticos. A medida que el cambio climático modifica los patrones de precipitación, nuestros modelos ofrecen herramientas espaciales para priorizar áreas resilientes de reintroducción y orientar el manejo a largo plazo de esta especie endémica de la isla.

Más allá de la elevación: la cobertura de dosel como posible filtro ambiental en la segregación espacial del Zumbador Dorado (*Anthracothorax aurulentus)* y el Zumbador Verde (*A. viridis)* en un paisaje en recuperación

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Categoría: Ecología-Ecología del paisaje

Puerto Rico es de las pocas jurisdicciones donde ocurren dos especies del género Anthracothorax: *Anthracothorax viridis* y *Anthracothorax aurulentus.* No obstante, aún existen vacíos relacionados con las dinámicas ecológicas que ocurren entre estas especies hermanas, que a su vez nos permitirían entender las presiones selectivas que eventualmente indujeron su divergencia. Aunque se ha estipulado que ambas especies son segregadas por elevación, esta hipótesis fue propuesta hace 50 años sin tomar en cuenta el contexto forestal de la Isla y actualmente existen registros de ambas especies con rangos de elevación solapados. Este estudio se enfocó en explorar posibles variables que podrían segregar espacialmente a *A. viridis* y *A. aurulentus.* Para esto, se utilizaron datos de ocurrencia descargados de GBIF, elevación, NDVI y cobertura de dosel entre 2000 y 2023 para determinar si la elevación junto con la cobertura boscosa causa que ambas especies se segreguen espacialmente. Asimismo, tomando en cuenta la Teoría de Transición de Bosque, se exploró si la abundancia relativa de *A. viridis* aumentó en elevaciones bajas con el paso de los años. Se encontró que en comparación a *A. aurulentus*, la probabilidad de encontrar a *A. viridis,* al igual que su abundancia, aumenta con cobertura de dosel y con la elevación, pero disminuye con el NDVI. Asimismo, el año tuvo un efecto positivo, lo cual sugiere una expansión temporal de *A. viridis* en el paisaje puertorriqueño. Esto podría implicar que el aumento de cobertura boscosa en Puerto Rico en las pasadas décadas aumentó la presencia de *A. viridis*. Sin embargo, aunque la cobertura de dosel influye en la segregación espacial de ambas especies, la elevación también sigue siendo un predictor fuerte.

Resúmenes -Presentaciones en Formato Oral

High-Humidity Karst Caves as Reservoirs of Fungal Biodiversity and Potential Pathogens in Puerto Rico.

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Categoría: Ciencias Ambientales-Avalúo de riesgo ambiental

Este proyecto propone la caracterización molecular de comunidades fúngicas en el sistema de cuevas kársticas del norte de Puerto Rico, específicamente en Cueva Matos en Arecibo y Cueva Buruquena en Morovis. Estas cuevas son entornos de alta humedad y microclimas estables con temperaturas que van de los 26°C a 35°C, sirviendo como hábitats de colonias activas de murciélagos. Estas condiciones ambientales y la alta biomasa que albergan hace de los sistemas cavernarios modelos ideales para estudiar la diversidad fúngica y la presencia de especies patógenas como Histoplasma capsulatum (causante de histoplasmosis en humanos) y Ophidiomyces ophidiicola (causante de la enfermedad fúngica de serpientes). El trabajo aquí presentado integra muestreo de aire por casetes "Air-O-Cell" y "Via-Cell", toma de materia de suelo, extracciones de ADN ambiental (eDNA), análisis y secuenciación por Nanopore de eDNA, y cuantificación de esporas para recopilar datos y evaluar la diversidad y la aparición de patógenos. A través de estas técnicas se ha podido comprobar de manera inicial que estas cuevas contienen una alta variedad de hongos, y que cumplen con condiciones ambientales favorables para el desarrollo fúngico patogénico como el de los hongos H. capsulatum y O. ophidiicola. Estos datos se incluirán en una investigación en curso que contribuirá a establecer mejores estrategias de conservación, al monitoreo de la salud ambiental y a la expansión de las líneas base de diversidad microbiana en el ecosistema kárstico tropical.

Este proyecto es financiado por el Centro de Investigación y Creación de la Universidad de Puerto Rico en Arecibo.

Inherently at Risk: Low morphological variability predicts conservation risk

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Categoría: Ciencias Ambientales-Evaluación de riesgo de extinción

Extinction is a persistent outcome across evolutionary history, whereas other lineages persist over long timescales, implying that intrinsic biological traits may influence long-term survival and contemporary extinction risk. Morphological niche breadth—the degree of within-species phenotypic variability—may shape ecological flexibility, interaction breadth, and a lineage's capacity to buffer environmental change. Species with restricted morphological variance may therefore experience limited ecological adaptability and heightened vulnerability. In this study, we evaluate whether reduced floral morphological dispersion is associated with higher conservation risk in orchids. Using species-level coefficients of variation (CV) for seven floral dimensions, we fitted weighted logistic regressions across 30 multiple imputations and performed complete-subset model selection using the Bayesian Information Criterion (BIC). BIC favored highly parsimonious models: the best model contained a single predictor (CV of sepal width), and the $\Delta BIC \leq 4$ set consisted of seven models with only 1–2 predictors. Sign-direction analyses showed a consistent pattern across both marginal and BIC-weighted models: for most traits—sepal width, petal width, petal length, labellum width, and sepal length—lower floral variability (smaller CV) was associated with a higher probability of being classified as "Threatened". This directional consistency suggests that reduced phenotypic breadth in these structures may be a general indicator of elevated extinction risk. A single trait, column length, showed the opposite trend, with increased variability associated with higher risk, indicating that not all floral dimensions contribute equivalently to resilience or constraint. Predictive performance of the BIC-averaged model reflected class imbalance: ROC AUC $\approx$ 0.53 and PR AUC $\approx$ 0.74, but threshold optimization provided interpretable decision rules. A cost-sensitive threshold (FN:FP = 5:1) yielded a practical operating point ($t \approx 0.53$) for prioritizing species most likely to be at risk. Overall, our results reveal that reduced morphological variability in key floral traits is consistently linked to higher conservation risk. This trait-based framework provides a transparent, biologically interpretable screening tool for identifying species that merit heightened conservation attention and may help improve triage and prioritization in data-limited systems.

Agroecología comunitaria: una herramienta para la sostenibilidad socioambiental en Río Piedras

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Categoría: Ciencias Ambientales-Agroecología.

La agroecología es una alternativa sostenible para disminuir el deterioro de los ecosistemas a nivel global, asociado al consumo de productos no locales, provenientes de monocultivos. Recientemente en Puerto Rico, el movimiento agroecológico ha cobrado mayor pertinencia como respuesta radical al deterioro ambiental causado por la siembra convencional y la dependencia de las importaciones. Cerca del ochenta por ciento de los alimentos que se consumen en la isla son traídos del exterior. La agroecología, como práctica, promueve la producción local, la regeneración de suelos y la conservación de procesos ecológicos claves para la salud de los ecosistemas. Sin embargo, es necesario estudiar las condiciones socioambientales que favorezcan o no la permanencia y la capacidad productiva de los proyectos agroecológicos. El Huerto, Vivero y Bosque Urbano Comunitario de Capetillo es un proyecto colaborativo entre la Comunidad y la Universidad de Puerto Rico, Recinto de Río Piedras, a través de CAUCE, que realiza actividades de educación, de conservación ecológica y de producción agroecológica de hortalizas y árboles frutales. Este proyecto se gesta en el contexto urbano donde las altas temperaturas provocan efectos de isla de calor, deteriorando las condiciones ambientales para la siembra. Por esta razón, queremos entender: ¿cuáles son las variables socioambientales que afectan la producción agroecológica de un huerto urbano? A través de la implementación de un plan de siembra en los últimos tres años, el proyecto ha monitoreado el peso de las cosechas, la temperatura, la precipitación y la participación de los agricultores. Los hallazgos muestran un crecimiento escalonado en la producción: de 48.194 kg en 2023, a 103.53 kg en 2024 y a 141.70 kg en 2025, siendo agosto y noviembre los meses de mayor rendimiento. Aunque los datos de la NOAA confirman un incremento de la temperatura y la precipitación en San Juan durante 2024 (27.43 °C y 0.24 mm) y 2025 (28.48 °C y 0.26 mm), consideramos prematuro establecer una correlación climática directa. Entendemos que el aumento de la cosecha se vincula inicialmente con la organización del plan de siembra y la disponibilidad de personal. A pesar de contar con una base de datos pequeña, el registro y monitoreo de las variables socioambientales que afectan la producción de hortalizas es determinante para documentar los retos y aciertos de nuestro proyecto y potencialmente los de otros proyectos agroecológicos en Puerto Rico y el Caribe.

Land-use and land-cover changes in Sierra de Cayey, Puerto Rico: implications for conservation

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Categoría: Ciencias Ambientales-Sistemas de Información Geográfica (GIS)

Transformations of the landscape, driven by human and non-human phenomena, have strongly structured the composition of herpetofauna in recent ecological time, particularly in the Caribbean. In the Sierra de Cayey, Puerto Rico (SCPR), shifts from an agriculture-based economy to industrialization during the mid-20th century led to agricultural abandonment, promoting secondary forest regeneration and increasing landscape heterogeneity. SCPR forest cover changed dramatically, increasing from less than 20% in 1937 to approximately 62% by 1995 post-agriculture abandonment. These changes may have influenced population dynamics and extinction risk, particularly for habitat specialists such as *Eleutherodactylus jasperi* (Golden Coquí Frog), which has not been recorded since 1981. This study aims to analyze and map historical and recent land-use and land-cover changes in the SCPR region to identify spatial patterns, quantify landscape transformations, and assess their conservation implications. Ultimately, these findings will provide a framework to guide conservation planning, habitat management, and sustainable development.
This study integrates historical aerial photography, satellite-derived land-cover datasets, and published sources to reconstruct spatiotemporal patterns of land-use and land-cover change in the region. Land-cover classifications were standardized across time periods and mapped using supervised classification approaches. Change detection analyses and transition matrices were used to quantify changes in classifications. Preliminary results showed reductions in agricultural land and an increase in forest regrowth concentrated in higher elevations and across time. Potential refugia for *E. jasperi* will be identified, and it will be evaluated whether land-use transitions, in combination with ecological specialization, contributed to its decline.

El ser humano como proceso ecológico

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Categoría: Ecología-Biología de la conservación

La biología de la conservación tradicionalmente ha promovido la protección estricta y la idea de dejar los ecosistemas intactos. Sin embargo, desde una mirada agroforestal surge la pregunta de si conservar implica excluir al ser humano o si es posible integrar manejo activo, producción y restauración en un mismo paisaje. En una finca en Utuado, cercana al aviario de la cotorra puertorriqueña, se desarrolla un modelo que cuestiona esa separación y propone una integración consciente entre biodiversidad y actividad humana. El proyecto crea espacios para la siembra estratégica de árboles endémicos, nativos y en peligro de extinción con el fin de expandir el hábitat disponible para la cotorra y otras especies de fauna. En lugar de abandonar el terreno, se implementa un diseño agroforestal que combina restauración ecológica con producción sostenible, diversificando estratos y funciones. La selección de especies responde a criterios ecológicos y sociales: árboles que proveen alimento y refugio para la cotorra, especies que aportan sombra y materia orgánica, y cultivos compatibles que permiten presencia humana sin degradar el sistema. Desde esta perspectiva, la conservación no se limita a preservar fragmentos aislados, sino que reconoce el potencial del manejo regenerativo para acelerar procesos sucesionales, aumentar diversidad genética y fortalecer conectividad ecológica. La agroforestería actúa como puente entre bosque y finca, integrando producción, restauración y educación ambiental. El ser humano deja de ser visto solo como perturbador y se convierte en actor responsable dentro del sistema, participando en la siembra, el monitoreo y el cuidado del paisaje. Este enfoque promueve resiliencia frente a disturbios, mejora servicios ecosistémicos como regulación hídrica y conservación de suelos, y amplía la disponibilidad de recursos para fauna nativa. En síntesis, la finca funciona como laboratorio vivo donde conservación y agroforestería convergen, demostrando que la convivencia intencional entre personas y biodiversidad puede fortalecer la recuperación de especies en peligro y consolidar ecosistemas más complejos, productivos y sostenibles.

An integrative approach to conservation biology: the molecular genetics and reproductive ecology of Caribbean hollies (*Ilex*).

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Categoría: Ecología-Biología de la conservación

Species conservation, though essential to the maintenance of biodiversity, carries a high cost in both effort and resources, making accurate species identification invaluable. Historically, our knowledge of the relationships between taxa has been based on morphology. While precise for broader taxonomic rankings, its accuracy declines at the species, and sometimes genus, level due to convergent evolution, overlapping traits, and intraspecific variation. The genus *Ilex*, with over 500 species worldwide, is one such group that faces difficulty in morphological species identification due to these reasons, with some authors claiming the group is impossible to parse solely using morphological traits. Within the Caribbean clade of this genus, a recent taxonomic reclassification has reduced the number of taxa from 50 to 32, using morphological methods. As a result, some federally-endangered island endemics, like *I. sintenisii* in Puerto Rico, lost these designations, the latter now a synonym of the more widespread *I. obcordata*. This ongoing project aims primarily to deliver a robust, and resource-efficient, molecular-based taxonomic assessment and phylogenomic reconstruction of the Caribbean Ilex clade using novel target capture on DNA of herbarium-preserved tissue. Subsequently, conservation action will be guided through the generation of organismal and population-level data using both population genomics and ecological field methods. The former will allow measuring population genetic variability and differentiation, and the level of inbreeding while the latter will allow assessing phenology, sex ratios, and the identity of pollinators and dispersers. Preliminary phylogenomic reconstructions of this clade do not support the synonymization of *Ilex sintenisii* and *Ilex obcordata*, aligning instead with prior circumscriptions of *Ilex sintenisii* as an evolutionarily distinct taxon endemic to Puerto Rico. In addition, ongoing field work has revealed patterns of reproduction throughout the year, allowing a comprehensive understanding of the phenology of *I. sintenisii*.

Financed by United States Fish and Wildlife Grant #F23AC02553-00: “Species boundaries delimitation within the genus *Ilex* in Puerto Rico, with emphasis on the Federally-listed *Ilex sintenisii and Ilex cookii*”.

Occurrence of Microplastics in Rocky Shore Chitons from Contrasting Anthropogenic Zones in Puerto Rico

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Categoría: Ecología-Ecología animal

Microplastic pollution is an increasing concern in coastal ecosystems, yet many benthic organisms remain understudied as potential bioindicators of contamination. Chitons, marine mollusks that graze on rocky substrates, are in constant contact with sediments and surface particles, making them particularly susceptible to ingesting microplastics present in biofilms and detrital material. Due to their feeding behavior and close association with intertidal substrates, chitons may provide valuable insight into the presence and distribution of microplastics in coastal environments. This study evaluated the occurrence of microplastics in chitons from two coastal areas of Puerto Rico that differ in levels of anthropogenic influence: San Juan Bay, characterized by intense urban and maritime activity, and Piñones, a coastal area with comparatively lower anthropogenic pressure. Specimens were collected from multiple sampling locations within each area. A total of 54 chitons were analyzed, with *Acanthopleura granulata* being the most abundant species. Laboratory processing included chemical digestion to remove organic matter, followed by filtration and ultraviolet light examination to facilitate particle detection. Microplastic-like particles were detected in chitons from both study areas, with fibers representing the most common particle type. Individuals collected from the more urbanized environment showed a greater abundance of particles compared to those from the less impacted site, and statistical analysis (Mann–Whitney U test) indicated significant differences between locations. These findings highlight the influence of anthropogenic activity on microplastic contamination in coastal ecosystems and support the potential use of chitons as bioindicators of microplastic pollution in rocky intertidal environments.

Distribution of the Genus *Aspiduchus* in Puerto Rico: Insights from Citizen Science and Field Observations

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Categoría: Ecología-Ecología animal

The genus *Aspiduchus* represents a poorly studied group of arthropods in Puerto Rico, with limited ecological and distributional information available. These species are generally overlooked due to their cryptic habits and lack of charismatic traits, which has contributed to significant gaps in knowledge regarding their natural history and habitat use. Improving our understanding of their distribution is essential for documenting the biodiversity of subterranean ecosystems on the island. This study compiled occurrence records of *Aspiduchus* across Puerto Rico using a combination of citizen science observations from online platforms, literature reviews, and interviews with individuals who have reported sightings of these organisms. These complementary sources of information were used to identify patterns in habitat use and geographic distribution. Most records indicate that *Aspiduchus* species are strongly associated with subterranean environments, particularly cavities and underground spaces within the northern karst region of Puerto Rico. Through the integration of these data sources, populations were documented in ten subterranean cavities associated with the northern karst landscape. These findings highlight the importance of integrating citizen science data and local ecological knowledge to improve the documentation of poorly known taxa. Our results also emphasize the ecological significance of subterranean habitats in the northern karst region and the need for further research to better understand the diversity, ecology, and conservation status of *Aspiduchus* species in Puerto Rico.

Observing dynamics between native and non-native tree species in recovering Puerto Rican wet forest

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Categoría: Ecología-Ecología de especies invasoras

Over 80 years ago, only 6% of Puerto Rican forest cover remained after mass deforestation for agricultural exploitation. Much of the island that is not urbanized consists of recovering secondary forest. Forest recovery faces many challenges, such as invasive species, which race to occupy niche space and prevent the establishment of native species. We analyzed a database of forest plots with varying times since post-agricultural land abandonment to determine whether the presence of non-native tree species affected the process of forest recovery. We found that older forests exhibit a high alpha diversity, with low species turnover and high abundance of individuals. Diversity of native species was significantly reduced when non-native trees were present. Invasive species showed stark declines across the five survey years, likely due to pathogen spillover and high single-species dominance.

Long-term survival and movement patterns of the endangered Yellow-shouldered Blackbird in southwestern Puerto Rico

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Categoría: Ecología-Ecología de poblaciones

The Yellow-shouldered Blackbird (*Agelaius xanthomus*) is an endangered species endemic to Puerto Rico, historically impacted by habitat loss and brood parasitism by the invasive Shiny Cowbird (*Molothrus bonariensis*). While conservation actions have improved nesting success, very little is known about survival beyond the nest stage, particularly during juvenile and adult life stages, which are critical for population persistence. From 2021 to 2025, we conducted a telemetry study in southwestern Puerto Rico to estimate survival and movement across life stages. A total of 69 individuals were tagged as fledglings using solar-powered CTT hybrid transmitters, allowing continuous tracking from fledging through adulthood. Survival was estimated using Nelson–Aalen estimator, and movement patterns were quantified using home range analyses through R. Survival varied by life stage, with fledglings (0–75 days) showing the lowest survival (0.873 ± 0.05), followed by juveniles/subadults (0.901 ± 0.04), and adults exhibiting the highest survival (0.981 ± 0.02). Adults had significantly higher survival than fledglings ($p = 0.006$). Mortality was primarily driven by exposure (50%), hurricane-related events (37.5%), and predation (12.5%). Exposure occurred within the first four days post-fledging, highlighting this period as a key survival bottleneck, while hurricane-related mortality occurred later in the juvenile stage. Fledgling home ranges were relatively small (approx 94–138 ha), whereas adults exhibited larger ranges that varied by season, with significantly larger ranges during the non-breeding period (up to -658 ha). This study provides the first estimates of long-term survival and movement across life stages for this species. Our findings highlight the importance of early post-fledging habitat structure and the influence of extreme weather, and will improve population viability models and conservation strategies for this endangered species.

Beyond the Original Records: Expanding the Known Distribution and Ecological Knowledge of a Cave Dwelling Millipede

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Categoría: Ecología-Ecología de poblaciones

Troglobites are organisms traditionally considered to be strictly restricted to cave ecosystems, often exhibiting morphological and physiological adaptations such as reduced vision, depigmentation, and metabolic specialization. These species are important models for studying evolution in extreme environments and are key to understanding and conserving fragile subterranean ecosystems. *Ricodesmus uniporus*, a diplopod endemic to Puerto Rico, has been classified as a troglobite; however, available information is limited to morphological descriptions and records from only two cave systems, leaving major gaps in its ecology, distribution, and degree of cave specialization. This study prioritizes the systematic search for new populations and the ecological characterization of *R. uniporus* across cave systems beyond those reported in the original literature. Standardized transect surveys were conducted across multiple municipalities, with abundance expressed as individuals per meter. Surveys in Hatillo and Arecibo confirmed populations restricted to aphotic zones, with densities ranging from 0.07 to 0.33 individuals/m. Extensive exploratory surveys further documented the species in previously unreported caves in Lares and Utuado, including sites with densities exceeding 1 individual/m. Individuals were observed across multiple life stages, indicating established populations, and behavioral observations revealed retained photosensitivity. Although consistently associated with total darkness, the extent of its cave-specific adaptations remains uncertain. The expanded distribution, variability in densities, and persistence of photosensitivity challenge its classification as a strict troglobite. Additionally, the relatively recent geological formation of Puerto Rico's caves may limit the evolution of obligate cave traits. These findings suggest that *R. uniporus* may function as a specialized troglophile and highlight the importance of targeted field surveys for refining species classifications and informing conservation efforts.

An underestimated fighter: Population trends on the Puerto Rican Nightjar (*Antrostomus noctitherus*)

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Categoría: Ecología-Ecología de poblaciones

The Puerto Rican nightjar (*Antrostomus noctitherus*) is an endemic bird to Puerto Rico. Its distribution extended throughout the island in the past but is now restrained to the southwestern region. The species was considered extinct in the early 1900's and since its rediscovery in 1961 has been considered endangered. Studies monitoring the nightjar from 1973 up to 2010, have estimated a near constant abundance and density over time. This study seeks to determine whether the nightjar's estimated density and abundance has changed throughout the years, with emphasis on the evaluation of effects that hurricane Maria had on the populations. The National Ecological Observatory Network collected survey data at eight plots in Guánica State Forest once a year between the months of May and July of years 2015-2024. Six-minute point counts were conducted at nine points per plot with distance from observer measured by a laser rangefinder. NEON's data was analyzed through R, where density and abundance were estimated through the distance-sampling model as applied in the R package "unmarked". In total, 112 nightjars were detected in 724 counts. The impact of hurricane Maria was not significant in the population, which appeared constant. The best-fit distance sampling model for the data estimated a density of -0.14 ind/ha, concordant with values reported from 1972 to 1992. This number is a conservative estimate, as one study conducted in 2007 calculated -1.63 ind/ha using a custom detection function for the species. Further studies employing this detection function will allow confirming population stability within Guánica State Forest.

Variation in Body Condition and Diversity of Chitons Across Two ContrastingAnthropogenic Zones in Puerto Rico

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Categoría: Ecología-Ecología de poblaciones

Chitons (*Class Polyplacophora*) are key components of rocky intertidal ecosystems, contributing to algal regulation, bioerosion, and habitat structuring. Despite their ecological importance, limited information exists on how anthropogenic disturbance influences their population dynamics and physiological condition in tropical coastal systems. This study evaluated the abundance, species richness, and body condition of chitons across two coastal areas in Puerto Rico with contrasting levels of anthropogenic activity. Three linear transects were established at each site, where quadrat sampling was used to quantify abundance and assess species richness. Morphometric measurements (length, width, and weight) were collected for all individuals, and body condition index (BCI) was specifically estimated for *Acanthopleura granulata* using the residuals of a regression between log-transformed body mass and length. Results showed contrasting ecological patterns between sites. The area with high anthropogenic activity exhibited higher chiton abundance but lower species richness, whereas the low-impact area supported fewer individuals but greater richness. Diversity patterns indicated higher heterogeneity in the impacted site, while the low-impact site was dominated by *A. granulata*. Morphometric analyses revealed that individuals from the low anthropogenic activity area were generally larger and heavier. Body condition index differed significantly between sites (Mann–Whitney U test, $p = 0.0186$), with *A. granulata* individuals from low anthropogenic activity areas exhibiting higher BCI values (mean = 0.078) compared to those from high activity areas (mean = -0.130), suggesting reduced physiological condition under disturbed conditions. Within the impacted site, individuals associated with natural substrates showed higher mean BCI than those from artificial and mixed substrates, although differences were not statistically significant (Kruskal–Wallis test, $p = 0.205$). Overall, these findings highlight the influence of anthropogenic disturbance and substrate type on chiton ecology and support their role as bioindicators of coastal change.

More Than Just a Legume: How Microbial Communities Shape the Survival of Puerto Rico's Endangered *Chamaecrista glandulosa var. mirabilis.*

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Categoría: Ecología-Ecología microbiana

Leguminous plants are crucial for ecosystem sustainability through organic matter enrichment, nutrient cycling, water retention, and nitrogen fixation. This study explores the microbial communities associated with root nodules, leaves, and surrounding soils of *Chamaecrista glandulosa var. mirabilis*, an endangered legume endemic to Puerto Rico. Confined to fragmented habitats of acidic, nutrient-poor siliceous sands, this species faces environmental pressures that likely influence its microbiome. Understanding these microbial communities is essential for developing effective conservation strategies. We collected 32 samples from leaves (n=10), soil (n=11), and root nodules (n=11) from 11 individuals at the Reserva Natural Laguna Tortuguero, Puerto Rico, in spring 2024. Metagenomic DNA was extracted using the DNeasy PowerSoil Pro Kit (Qiagen), quantified with a NanoDrop 2000, and amplified for the 16S rDNA gene. Sequencing was conducted on an Illumina MiSeq (300 x 300 bp). Data analysis using QIIME2 included alpha and beta diversity, taxonomy distribution, and differential abundance, with visualizations created using GraphPad Prism (Version 10.4.1). Taxonomy was assigned using the silva-138.1 taxonomic database. Results: Rarefaction was performed to 20,511. Samples showed significant differences in alpha diversity indices (Observed Species, Shannon Entropy, Faith PD) among groups ($p < 0.05$). Beta diversity (Bray-Curtis and Weighted UniFrac) indicated distinct community compositions across leaves, nodules, and soil samples ($p < 0.05$). Differential abundance analysis identified key taxa: *Nitrosococcus* in soil, *Bradyrhizobium* in nodules, and *Methylobacterium* in leaves, all significant ($p < 0.05$) with fold changes of $|2|$. This study reveals distinct microbial communities associated with different plant structures of *Chamaecrista glandulosa var. mirabilis*, highlighting their potential roles in nutrient cycling and environmental adaptation. *Nitrosocomiscus* enrichment in soil suggests involvement in nitrogen cycling, enhancing soil fertility under nutrient-poor conditions. *Bradyrhizobium* dominance in nodules confirms its role in nitrogen fixation, supporting plant growth in challenging soils

Monitoring fecal indicator inputs across the San Juan Bay Estuary regions

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Categoría: Ecología-Ecología microbiana.

The San Juan Bay Estuary (SJBE) is located in Puerto Rico's northern Metropolitan area and consists of interconnected channels, lagoons and an open bay. One of SJBE's main channels is the Caño Martin Peña (CMP), which faced rapid rates of urbanization, infilling, decreased waterflow and loss of mangrove forest during the 1950s. Due to a combination of underdeveloped sanitary and stormwater infrastructure, the CMP coastal communities are exposed to sewage-enriched waters that flood streets, homes, and schools. Public health research has found high occurrences of gastrointestinal diseases, respiratory illnesses, and skin infections in residents of these communities. In this study, we sought to (1) quantify fecal indicator bacteria (FIB) across seasons, (2) identify the relationship between FIB and human sources of fecal contamination, and (3) determine the influence of environmental parameters on FIB concentrations. Surface water was sampled once a month from 2021-2023 in 16 sites throughout 6 regions: San Juan Bay, CMP, San Jose Lagoon, Suarez Channel, Torrecillas Lagoon and Piñones Lagoon. Water samples were analyzed for FIB Enterococcus and E. coli concentrations using the defined substrate method, qPCR was used to quantify the human marker HF183, and a YSI multiparameter was used to measure in situ physicochemical data. CMP sites exceeded EPA standards for recreational waters for Enterococcus (35 CFU/100ml) 99% of the time, and 94% for E. coli (200 CFU/100ml), while the other regions exceeded the criteria in 49% and 44% of the time, respectively. Spearman's correlation tests indicated significant correlations (P-values $\leq$ 9.5x10-5) between Enterococcus and HF183 in only 2 of 6 regions, compared to 5 of 6 regions for E. coli and HF183 (P-values $\leq$ 0.014). This suggests that E. coli in SJBE is mainly human-derived, whereas Enterococcus may originate from alternative sources. CMP's FIB concentrations were high across seasons, and no strong correlation was identified with any environmental parameters suggesting a constant source of untreated water inputs. Contrarily, other regions had significant correlations with 24and 48-hour rain before sampling, turbidity, and salinity, indicating an influence from runoff and tidal fluctuations. Our ongoing study assesses how a major urban ecosystem restoration effort—incorporating dredging, infrastructure upgrades, and improved flow—mitigates contamination of flooded waters and improves SJBE microbial water quality.

This project was supported in part by an appointment to the Research Participation Program at the Region 2, U.S. Environmental Protection Agency, administered by the Oak Ridge Institute for Science and Education through an interagency agreement between the U.S. Department of Energy and EPA.

Microbial Diversity in Saline Microbial Mats: Insights from the Cabo Rojo Salterns

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Categoría: Ecología-Ecología microbiana

Saline microbial mats are multilayered microbial communities found in hypersaline environments such as salt flats, lagoons, and salterns. These mats host diverse microorganisms, including bacteria, archaea, and fungi, which play key roles in biogeochemical cycling and ecosystem stability. Extreme conditions select for unique microbial adaptations, making these mats valuable models for microbial ecology, evolution, and biotechnological applications. This study aims to characterize bacterial communities in microbial mats from the Cabo Rojo Salterns, Puerto Rico, comparing sites with varying levels of anthropogenic impact. Twenty-four microbial mat samples were collected from the Cabo Rojo Salterns. Soil samples from different depths were selected for metagenomic DNA extraction using the DNeasy PowerSoil Pro Kit (Qiagen). DNA was quantified with a NanoDrop 2000 and amplified for the 16S rDNA gene. Sequencing was performed on an Illumina MiSeq (300 × 300 bp). Data analysis with QIIME2 included alpha and beta diversity, taxonomic classification, and differential abundance. Taxonomy was assigned using the SILVA-138.1 database, and visualizations were created in GraphPad Prism (v10.4.1). Microbial community composition varied significantly across samples (PERMANOVA, $p = 0.002$). Richness analysis showed uniform distribution across mats, except for Mat 34, which exhibited significantly higher richness ($p < 0.05$). Shannon entropy indicated higher diversity in mats from Candelaria Lagoon. Diversity and feature abundance decreased with depth. The predominant phyla were *Heliobacteria*, *Proteobacteria*, *Bacteroidota*, and *Asgardarchaeota.* At the genus level, *Lokiarchaeia*, *Bathyarchaeia*, *Halanaerobium*, and *Salinibacter* were most abundant. Sampling location influenced microbial diversity, with higher diversity in mats from sites with less anthropogenic impact, emphasizing human influence on microbial ecosystems. Saline microbial mats harbor microbial diversity with potential biotechnological applications. Future work includes predicting functional roles using PICRUSt2 and analyzing ITS2 data to characterize fungal communities and their correlations with bacterial abundances.

This research was supported by a feasibility grant from the Puerto Rico IDeA Network Biomedical Research Excellence (PR-INBRE, P20 GM103475-21).

Forest ecosystems in the urban landscape: relation between the geological substrate, soils, and land cover

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Categoría: Ecología-Ecología urbana

Human needs have altered plant cover, creating new matrices that incorporate anthropogenic elements into the landscape. This process, known as urbanization, resulted in the filling of low topographic areas of the city, establishing novel soil types over the original soils and introducing non-native plant species. Some consider the forests developed under these circumstances to have little or no conservation value because they are often dominated by introduced species, appear to be highly homogenized, and lack ecological attributes associated with old-growth forests. The lack of knowledge about these urban forests and their potential to maintain biodiversity and mitigate climate change makes them a robust area of research for ecologists. In this study, I ask whether urban vegetation comprises distinct plant communities. What is the assembly of these different plant communities along urban gradients of soil and geologic substrates? This study analyzed the structure, composition, and properties of urban vegetation. Because San Juan's climate is uniform across the city (subtropical moist forest life zone), this research focused on two potential drivers of vegetation community assembly and diversity in the urban area: land cover and surface geology. I hypothesize that a) the geological substrate and soil type influence the green cover configuration and distribution; b) the composition of plant communities in the city is maintained by substrate and soil diversity influenced by the geologic formation. To address these hypotheses, I conducted vegetation and soil sampling in three forest stands over four geological substrates (alluvial, volcanic, karst, and artificial fill) within urban forests in the San Juan Metropolitan area of Puerto Rico. Our data showed differences in biodiversity between different soil substrates, with vegetation community dissimilarities ranging from 64% to 91%. This research project will contribute to understanding novel urban ecosystem structure, functioning, and productivity. Consequently, it will provide new criteria for urban vegetation management, increasing the potential of ecosystem services that urban vegetation can provide to society.

Community gardens: An international exploration of their Socio-Ecological Drivers for Urban Biodiversity and Ecosystem Services Provision

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Categoría: Ecología-Ecología urbana

By 2050, up to 75% of the global population will live in cities. Urban greenspaces support human well-being, yet the drivers of their biodiversity and ecosystem services remain poorly understood, particularly across diverse environmental and cultural contexts. Community gardens are an increasingly common but understudied form of urban greenspace. As food production is a primary motivation, management decisions may strongly influence biodiversity and ecosystem services. These decisions are shaped by ecological (e.g., growing conditions), socio-economic (e.g., income, age), and cultural factors (e.g., crop preferences). Cultural influences are especially relevant, as gardens often bring together participants with diverse backgrounds and practices rooted in different relationships with nature and agriculture. We examine socio-ecological drivers of biodiversity and ecosystem services in community gardens across three contrasting places: Puerto Rico, Montreal (Canada), and Málaga (Spain). We test how cultivated plant diversity varies with garden and gardener characteristics, and how this diversity influences ecosystem services, including habitat provision for urban wildlife such as birds. Preliminary results (n=11 gardens) show a positive relationship between garden area and plant species richness. Gardener age and socioeconomic status also influence diversity, with peak richness among gardeners aged 50–60 and those at low or high income levels. Future work will assess how these relationships vary across regions and environmental contexts. This study provides a comparative understanding of biodiversity and ecosystem services in community gardens, with particular relevance to the understudied Caribbean region. Our dataset also enables examination of how traditional practices shape biodiversity both in Puerto Rico and among Caribbean gardeners abroad.

Manejo y trasplante de *Chamaecrista glandulosa var. mirabilis* en individuos de una población remanente de Dorado y en individuos propagados en vivero

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Categoría: Ecología-Ecología vegetal

Chamaecrista glandulosa var. mirabilis es una leguminosa arbustiva endémica del norte de Puerto Rico y una de las especies más amenazadas del archipiélago. Fue catalogada en peligro de extinción en 1990 debido a su distribución extremadamente limitada, la degradación acelerada de su hábitat y su escasa regeneración natural (USFWS, 1994). Esta variedad es exclusiva de bosques secos costeros sobre suelos arenosos y silíceos (DRNA, 2016). Su ciclo reproductivo ocurre mayormente de diciembre a febrero y se ha documentado herbivoría significativa por larvas de *Phoebis sennae* (López Colón, J. A., 2023). Una población remanente fue ubicada en un predio privado del municipio de Dorado, donde inicialmente se identificaron siete individuos, de los cuales solo cinco permanecían vivos al inicio del estudio y dos de ellas en condiciones críticas. Desde julio de 2023 hasta noviembre de 2024 se implementó un monitoreo, identificando infestaciones severas de cochinillas, escamas chupadoras, ninfas de saltamontes y hormigas, lo que provocó debilitamiento progresivo y muerte de algunos individuos. Además, no se observó reclutamiento natural en el predio, pese a la alta producción de flores y semillas. Como respuesta, se estableció un protocolo de germinación en vivero, logrando tasas de germinación exitosas y el desarrollo de más de 90 plantas bajo manejo controlado. Se realizó un trasplante de los individuos madre al vivero, logrando la supervivencia de tres de las cinco plantas originalmente encontradas. Las plagas chupadoras continuaron representando un reto dentro del vivero, siendo controladas en un 95% mediante el uso de Imidacloprid, bajo recomendaciones técnicas. Algunas plantas en crecimiento alcanzaron desarrollo reproductivo en menos de un año, produciendo flores y en casos aislados vainas. En total, se conservan 93 individuos, aunque algunas continúan en recuperación debido a daños previos. Los resultados de este trabajo demuestran que *Chamaecrista glandulosa var. mirabilis* posee capacidad de reproducción y establecimiento en condiciones controladas, su supervivencia en el medio silvestre depende de intervenciones humanas continuas y del manejo activo del hábitat.

Reevaluando las colecciones liquénicas de Olof Swartz en Jamaica y sus implicaciones para la biogeografía de especies "cosmopolitas"

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Categoría: Ecología-Evolución

Veinticinco de las especies de líquenes tropicales más comunes del mundo se describieron a partir de material colectado en Jamaica por Olof P. Swartz, un destacado botánico sueco que visitó esta isla caribeña entre 1783 y 1786. Aunque actualmente estas especies se consideran de amplia distribución, estudios filogenéticos recientes sugieren que la distribución de muchos de estos taxones podría ser más restringido de lo que se cree. Con el propósito de reevaluar su circunscripción taxonómica, se realizaron colectas en Jamaica y se extrajo material genético para 14 de estas 25 especies. Análisis preliminares basados en taxonomía integrativa indican que, si bien varias de estas especies parecen tener una distribución extensa, muchas otras, como *Bunodophoron melanocarpum* y *Cladia aggregata*, podrían ser taxones endémicos de Jamaica. Además, algunos de los clados recuperados y asociados a estos taxones resultaron ser polifiléticos, lo que dificulta aún más la clarificación de su taxonomía y distribución. Utilizaremos el caso de las especies de Swartz para 1) Llamar la atención sobre el problema de la evaluación simplificada de caracteres morfo-anatómicos en taxones de distribución presuntamente amplia, 2) Resaltar la importancia de no asumir distribuciones cosmopolitas en especies con propágulos de dispersión pequeños y 3) Ilustrar la significativa, pero poco apreciada, contribución de los líquenes al endemismo insular caribeño.

Linking the evolutionary patterns of pollination and seed dispersal by mutualistic animals

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Categoría: Ecología-Evolución

Pollination and seed dispersal are ontogenically linked processes that play a central role in plant reproduction, population dynamics, and long-term evolutionary diversification. Despite their importance, these two processes are often studied independently, limiting our understanding of how their evolutionary trajectories interact with one another and with major plant life-history traits, such as growth form. My research examined the evolutionary relationships among pollination modes, seed dispersal strategies, and growth form across seed plants using a comparative phylogenetic framework. I assembled two complementary datasets: one focused exclusively on angiosperms and a second including both angiosperms and gymnosperms. Using these datasets, we reconstructed ancestral states, estimated transition rates among character combinations, and fitted phylogenetic generalized linear mixed models (GLMMs) to test for correlated evolution among traits. This integrative approach allowed us to quantify both the directionality and tempo of evolutionary transitions linking mutualistic interactions and plant growth form. Across both datasets, the most frequent and rapid evolutionary transition occurred from woody plants with biotic pollination and non-mutualistic seed dispersal strategies (W-BN) to woody plants exhibiting mutualisms for both pollination and seed dispersal (W-BM). This transition reflects the repeated acquisition of mutualistic seed dispersal while maintaining biotic pollination and a woody growth form. The second most frequent and rapid transition was from W-BN to herbaceous plants with biotic pollination and non-mutualistic seed-dispersal strategies (H-BN), indicating shifts in growth form while conserving biotic pollination and non-mutualistic seed dispersal strategies. Together, these results suggest that biotic pollination plays a key role in facilitating the evolution of mutualistic seed dispersal strategies and that the joint evolution of pollination and seed dispersal mutualisms has occurred disproportionately in woody lineages. More broadly, this study highlights the importance of considering multiple, interconnected life-history traits to better understand the evolution of plant reproductive strategies.

This research was supported by the Penn State Biology Department in the form of student awards to Alberto C. Cruz-Mendoza and an NSF grant DEB-2129365 to Tomas A. Carlo.

Functional macroecology and island biogeography of Caribbean Birds

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Categoría: Ecología-Macroecología

The study of islands as natural laboratories has provided critical insights into the processes that maintain and structure biodiversity. A pillar of island biogeography theory is the well-established link between the size of an island and its species richness – an idea that has been influential in applied conservation. However, species losses may be non-random, with certain traits or functional roles more likely to be missing from low-diversity systems. Here, I perform a macroecological assessment of functional biogeography in Caribbean birds. Combining data on morphology, diet, and distributions for over 200 species across 177 islands (ranging from < 1 to > 100,000km2), I test the idea that persistence on smaller islands is constrained by traits linked to space use through their influence on energetics, trophic level, or ecological specialization. Consistent with macroecological theory, species on the smallest islands tend to converge towards a relatively small 'ideal' body size between 30-100g. Across species, we found that extreme bill morphologies were associated with specialized diets (e.g. pure carnivores or herbivores), with mixed diets occurring at intermediate trait combinations. As diversity decreases, carnivores and their associated traits were lost first - consistent with higher space requirements at higher trophic levels. Herbivores, and associated extreme bill morphologies, were the most likely species to occur on the smallest islands. Despite predictions favoring generalists on smaller islands, species with mixed diets and intermediate trait values were under-represented. Together, these results indicate predictable links between traits, ecology, and extinction risk, with important implications for predicting biodiversity change.

Protecting Puerto Rico agriculture: A predictive perspective at resistance gene candidate against *Fusarium oxysporum f. sp. cubense* tropical race 4 in *Musa* spp. of Puerto Rico

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Categoría: Ecología-Evolución de genes

Bananas and plantains, which belong to the Musa genus, serve as essential global food sources, valued for their nutritional benefits and culinary uses. However, they face threats from diseases such as black sigatoka and Fusarium wilt, particularly from the highly virulent *Fusarium oxysporum f. sp. cubense* tropical race 4 (FOC-TR4), which has been reported in several Central American regions and has emerged in Venezuela. The potential spread of this strain to Puerto Rico has prompted researchers to explore resistant cultivars. Unfortunately, the understanding of resistance gene characterization and detection in Puerto Rico is limited. Molecular techniques, including PCR, qPCR, Sanger sequencing, and phylogenetics, were utilized to study in-vitro *Musa* spp. (Dwarf, Maiden, and Maricongo). This study aimed to identify resistance gene analog 2 (RGA2) and assess its abundance and evolution in *Musa* spp. from Puerto Rico. The results showed no significant variation in transcript levels of RGA2; however, phylogenetic analysis revealed that the Maricongo variety displayed considerable similarity to previously identified candidate resistance genes. This suggests that RGA2 is present in local cultivars, indicating its association with R-genes related to Fusarium resistance. This research contributes to the advancement of our understanding of the genetic diversity of resistance genes within local *Musa* spp., thereby establishing a foundation for subsequent research endeavors. Additionally, it offers valuable tools and insights to address both present and future challenges faced in the Caribbean region.

La montaña, El Monolito

Acuñando el término *minimalismo orgánico* para describir su proceso, **Gisela Colón** desarrolla un cuerpo de obra que explora la interconexión de las fuerzas que —a distintas escalas— componen y sostienen el universo. A través de esculturas, pinturas, instalaciones, video y sus emblemáticos monolitos, la artista invita a considerar los movimientos astronómicos, geológicos y metafísicos como manifestaciones de una misma energía vital.

La Montaña, El Monolito, presentada en Puerto Rico —tierra natal de la artista— revela las profundas maneras en que la geografía, la geología y la materia primordial del archipiélago han moldeado tanto su historia personal como su práctica artística. Las cordilleras que atraviesan la topografía montañosa del archipiélago permanecen como una presencia constante en su imaginario, acompañándola a lo largo de sus desplazamientos vitales—desde sus años en la diáspora en Los Ángeles hasta sus recorridos por territorios remotos alrededor del mundo. Estas formas montañosas informan decisivamente la verticalidad, la masa y la resonancia espiritual de sus monolitos, arraigando su práctica global en la memoria del lugar.

Puerto Rico como contexto añade varias capas de contenido adicional a su obra. Sin condicionar su lugar de enunciación ni opacar sus posibilidades discursivas, la aparición de este trabajo en el archipiélago se vincula inevitablemente a las conversaciones sobre el derecho al territorio y la mirada hegemónica sobre la naturaleza. La materialidad constitutiva de las obras y la iridiscencia de los pigmentos —su capacidad de atrapar la luz y transformarla— le acercan conceptualmente a una experiencia corpórea que provoca una reflexión acerca de la luz y lo que lo que ella ilumina.

Esta muestra suma las investigaciones de Colón al legado de artistas y referentes estéticos que apuntan desde el Caribe y sus respectivas diásporas al replanteamiento del paisaje como sujeto que define nuestro imaginario cultural. En ese sentido, el lugar —llamémosle: territorio, terruño, contexto o circunstancia— sirve como plataforma y vehículo sobre el cual se vinculan las experiencias de arraigo de la artista con la poética de los materiales que se activan a través de su proceso creativo. Colón, en un espíritu similar al de los artistas del barro y los escultores dedicados al diseño de intervenciones directas en la naturaleza, aporta una declaración de propósito que nos invita a reimaginar nuestro vínculo con la tierra en una temporalidad que trasciende las cronologías humanas.

Colón, quien ha sostenido una trayectoria artística de reconocimiento internacional, celebra con esta exposición en el Museo de Arte Contemporáneo de Puerto Rico su primera retrospectiva en el archipiélago.

Referencia: https://www.museomac.org/arte/exhibiciones/la-montana-el-monolito-gisela-colon

Curaduría:

- Alexandra Méndez García, Curadora Asociada del MAC
- Abdiel D. Segarra, Curador del MAC

Trópico Agridulce

Trópico agridulce se enfoca en la producción, preparación y consumo de la comida como un tema recurrente en el arte contemporáneo puertorriqueño y caribeño. Al señalar la relación imprescindible entre cosecha y cultura, esta exhibición ofrece una oportunidad para destacar obras de la colección del Museo de Arte Contemporáneo de Puerto Rico, reflexionando con ellas acerca de las complejidades de las redes de sustento que moldean nuestra cotidianidad.

Las implicaciones de lo agridulce, en su dimensión gustativa, hacen referencia a la relevancia histórica de la producción extractiva y monocultural del azúcar que dominó la agricultura colonial en el Caribe. Del mismo modo, reconciliar este contexto marcado por la violencia de las economías de plantación con el deleite inherente de saborear la comida, es, en sí mismo, un acto profundamente agridulce.

Lxs artistas cuyas obras se presentan en esta exhibición abordan temas como los efectos de la producción industrial de alimentos, la dependencia de las importaciones y los productos procesados sobre la agricultura local, y el impacto de la modificación transgénica en el suelo y la cosecha. Adicionalmente, resaltan la centralidad de la migración en la configuración de las prácticas alimentarias, la etnobotánica como herramienta de resistencia, y reclamos por la soberanía alimentaria.

Trópico agridulce comprende además, colaboraciones con agricultores y una comisión de MAC en el Barrio en el Taller Cabachuelas en Morovis. Estas iniciativas, junto al arte visual que se presenta en sala, interrogan el imaginario de la cocina nacional, los sistemas alimentarios contemporáneos y la complejidad de las redes políticas, económicas, sociales, ambientales y ancestrales a los cuales están intrínsicamente vinculados.

Referencia: https://www.museomac.org/arte/exhibiciones/tropico-agridulce

Curaduría: Alexandra Meléndez García, Curadora Asociada del MAC

Palafito

Palafito" acompaña a los artistas Jaime y Javier Suárez en la creación de una instalación monumental, mientras registra la historia y los desafíos del municipio de Cataño. La obra rinde homenaje a la comunidad de Juana Matos, a sus residentes y a líderes comunitarios como Pedro Carrión, quienes han defendido durante décadas los espacios naturales y la vida en la ciénaga. A través de un registro sensible, el documental captura las luchas históricas por la conservación del manglar y la memoria de las casas sobre pilotes, mostrando cómo Palafito se erige como un monumento vivo a la resistencia comunitaria, al territorio y a la relación inseparable entre agua, tierra y quienes la habitan.

La pieza, con jardín de manglar epífito, está coronada por una pequeña casa sin paredes que, en recuerdo a su origen de supervivencia, flota en socos que aluden al activismo ecológico para la conservación de la reserva natural.

Ejecutada artesanalmente con la participación de integrantes de la comunidad y de jóvenes voluntarios, el proceso se convirtió en una travesía de sucesión generacional para que se asumiera como emblema y evidencia de una colaboración social.

Referencia:
https://www.facebook.com/story.php?story_fbid=1154665650039326&id=10006487704474

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GRACIAS POR PARTICIPAR Y CONFIAR EN SECAs-PR
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