Silent Night? An Overview of Javan Slow Loris Social Behaviour and Vocal Communication

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Abstract:
The Critically Endangered Javan slow loris (*Nycticebus javanicus*) exhibits complex social behaviours including both acoustic and ultrasonic vocalisations that remain understudied. We aim to provide insight into the role of communication in slow loris social behaviour. We conducted observations on ten family units comprised of 21 radio-collared wild Javan slow lorises using all occurrences sampling from 18.00 – 05.00 between 2019 - 2022 in West Java, Indonesia. Additionally, we recorded vocalisations via an Echo Meter Touch Pro 2 to identify the characteristics of slow loris calls. We identified slow loris vocalisations using Kaleidoscope Lite and analysed the factors influencing vocalisations using a GLMM. We found that affiliative vocalisations are associated with affiliative behaviours such as leading (20%), following (8.33%) and neutral proximity (8.33%) while agonistic vocalisations occur more in fighting (15%), agonistic proximity (13.33%) and chasing (11.67%). We investigated the factors influencing acoustic vocalisation, including age, sex, conspecific type (relative or non-relative), number of offspring, proximity to conspecifics, and group size. Our analysis revealed significant associations: the number of offspring ($\chi^2 = 20.741$, $p < 0.001$) and the conspecifics type ($\chi^2 = 113.948$, $p < 0.001$) strongly influence vocalization patterns. Other factors such as age, sex, distance to conspecifics and group size showed no significant associations. These findings highlight the complexity of social interactions in a species commonly misconstrued as solitary. A deeper understanding of slow loris sociality is necessary to support conservation efforts for the species' survival.

Assessment of Diversity of Saproxylic Fungal Communities in a Boreal Forest

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Abstract:
Fungi change the structure of forest detritus over time as primary decomposers of organic matter, thus improving habitat suitability for a rotation of new organisms. Forest tree species can be broadly divided into Angiosperms (hardwood) and Gymnosperms (softwood) whose composition is mostly cellulose and lignin but differs in chemistry. Deadwood is therefore a nutritional resource harboring assorted groups of specialized, saproxylic fungal species. Our research aims to identify these fungi in a

boreal forest, characterize their succession, and assess effects of forest management strategies on their diversity. We hypothesize that: 1) Fungal communities form guilds that change as decomposition progresses; 2) Hardwood and softwood fungal communities differ leading to variation in ecosystems dominated by broadleaf trees vs conifers. MycoPins method was used to monitor fungal colonization in woody debris. Sterilized hardwood and softwood dowels (mycopins) were shallowly buried in 4 different environments in a boreal forest in Finland. 4 transects: a swamp, a broadleaf forest, and a protected forest with and without access by a keystone species reindeer, were sampled in 2022-2023. Dowels of each wood type were retrieved every 2 weeks and analyzed via metabarcoding. Metabarcoding included DNA extraction from mycopins, ITS region amplification via PCR, and next-generation sequencing. Data was analyzed using SCATA pipeline and R. The data provides preliminary support for our hypotheses. Our research emphasizes ecological importance of saproxylic fungi in boreal forests and paves the way for further investigations to design strategies to conserve biodiversity of decomposers.

Parched throat: the effects of wildfire smoke on Bornean gibbon vocal behavior

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Abstract:

The smoke and pollutants produced by ever-increasing wildfires worldwide are known to pose great health risks to humans, but there is limited research on how these pollutants, mainly particulate matter (PM2.5), affect wildlife. In 2015, Borneo's peatland wildfires thrust record-breaking levels of PM2.5 into the atmosphere, exceeding the EPA's unhealthy level (55µg/m3) by more than 30 times (1,800µg/m). To increase our understanding of the health risks to fauna, we used passive acoustic monitoring to study the vocal behavior of endangered Bornean white-bearded gibbons (*Hylobates albibarbis*). Gibbons are a useful indicator species as males and females produce loud, distinct calls and duets for several hours on most mornings. Recordings were collected at the Mungku Baru Education Forest in Central Kalimantan, Indonesia before, during, and after the wildfires in Jun-Dec 2019. We manually annotated gibbon vocalizations between 04:00–10:00 from pre-smoke, smoke, and post-smoke periods. To measure the impacts of PM2.5 on gibbons, we compared three measures of male and female

singing behavior: daily call rate, call and bout duration, and the timing of the onset of singing. Estimates of PM2.5 were obtained from the WRF-Chem model using the FINNpeatSM fire emissions inventory and used to define the onset of the smoke period when PM2.5 values exceeded the EPA's unhealthy level. Using passive acoustic monitoring to answer these questions surrounding smoke and wildlife will open up doors to further studies in which researchers can gain a better understanding of these health effects in ecologically threatened sentinel species while minimizing safety risks.

Shark Species Identification through DNA Barcoding

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Abstract:
Commercial distribution of seafood in New York City is questionable in that seafood products are often mislabelled, or labeled according to a broad taxonomic group rather than to species. A classic case includes the sale of shark meat. Shark species are typically simply labeled as "shark"; yet, the sale and distribution of sharks is most concerning given that many species are at risk. Laws therefore exist in New York State to protect specific species. Our research applied DNA barcoding of a portion of the cytochrome oxidase I gene to determine the species of sharks acquired in seafood stores in New York City. We have thus far used DNA barcoding procedures to identify the species of 39 specimens sold with the label "shark". These specimens included two that we identified, using DNA barcoding, as sandbar shark, *Charcharinus plumbeus*, which is Endangered according to the IUCN Red List and of which the landing and sale is prohibited in New York State. Additionally, three shark specimens marketed as "mako" turned out to belong to a species from a different Order, the Dusky smooth-hound (*Mustelus canis*). Dusky smooth-hound was the most abundant species identified in our dataset, followed by Atlantic sharpnose shark (*Rhizoprionodon terraenovae*). We also identified three specimens belonging to Blacktip (*Carcharhinus limbatus*). Our g results proved false advertisement, uncovering the sale of prohibited species, and further identifying the actual species of sharks distributed in New York City seafood trade. Expansions upon our study should include sampling in additional boroughs and for a longer duration to identify potential temporal trends.

The intrinsic and extrinsic drivers of extinction risk in lemurs (*Lemuroidea*)

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Abstract:
Understanding why some species are more susceptible to extinction than others is critical for implementing effective conservation strategies. Phylogenetic comparative methods (PCMs) have been used to understand the drivers of extinction risk, and are most effective when applied to an entire lineage. Lemurs represent a unique and diverse monophyletic group that evolved in Madagascar in relative isolation over millions of years. We investigated the drivers of extinction risk in lemurs using intrinsic (species' traits) and extrinsic (environmental) variables related to ecology, life-history, and biogeography. We evaluated the tempo and mode of trait evolution and used PCMs to examine correlations between traits and extinction risk. We used models of trait evolution and historic and future climate data to predict how lemurs will fare under climate change. The predominant drivers of extinction risk in lemurs were diurnal activity and longevity, which were positively and negatively associated with extinction risk, respectively. Body size, as well as temperature mean and temperature variance across a species' range, were also predictors of risk. We found no evidence for evolution punctuated by short periods of rapid change in response to environmental shifts or other factors (punctuated equilibria), suggesting that traits will not evolve to track Madagascar's changing climate. These results may inform conservation strategies in Madagascar by differentiating the role of intrinsic vs. extrinsic traits in extinction risk. Moreover, findings may contribute to preventing declines in other endangered and endemic taxonomic groups.

Conservation Considerations: Urban Waterway Usage by Harbor Seals & Gray Seals in NYC

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Abstract:
Maintaining a balance between conservation efforts and habitat usage by humans and animals is an ongoing concern in many shared communities around the world. Growing human and wildlife populations are pressuring resources, particularly in urban areas where marine habitats have undergone significant physical and ecological changes. Due to successful conservation efforts, research has documented the return of seals to

the New York City (NYC) waterways (Woo & Biolsi 2018) where at select locations Harbor seals (*Phoca vitulina*) and grey seals (*Halichoerus grypus*) aggregate on rocks to rest and thermoregulate. Given the geography of NYC, and the interconnection between the major waterways, we are proposing that seals use smaller interconnected channels to regularly travel from haul-out and feeding locations within NYC. In addition, we note that for longer seasonal migratory routes, using the rivers as vectors for transport between the Atlantic northeast and their most likely southernmost locations of the Chesapeake Bay (Jones & Rees 2020), would also greatly reduce the amount of distance and time necessary to circumvent Long Island. To date, there has been no published data of seals within the smaller channels of New York City, yet we observed an individual harbor seal traveling between the Throggs Neck and Whitestone Bridges, which separate the boroughs of the Bronx and Queens. Our observations in smaller tributaries suggest that seals likely use these routes for migration and movement within the urban landscape, underscoring the importance of further research for the conservation of these habitats amidst heavy maritime traffic.

Conserving Red Panda Hotspots in Sikkim Himalaya

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Abstract:
This talk addresses the critical conservation question of whether non-protected areas (non-PAs) demand the same equitable conservation strategies as protected areas (PAs), especially in the context of hosting endangered species like the red panda. Despite the significance of non-PAs in the biodiversity conservation framework, these areas often remain neglected in conservation measures and management policies, whereas PAs receive special attention. This oversight poses potential risks to habitats that are not prioritized, threatening the survival of species like the red panda.
Our research employed a combination of spatial analysis and model runs, ecological field data collection, and questionnaire surveys to identify red panda hotspots across the Sikkim landscape. The findings highlight the percentage of the area occupied by red pandas, their distribution patterns, suitable habitat parameters, species associations, threats, and major hotspots within Sikkim's red panda territory. This information is crucial for the conservation of an endangered arboreal species that is profoundly influenced by environmental, social, and geographic factors.
Our results underscore the vulnerability of non-PAs compared to PAs, despite non-PAs housing a larger population (70%) of red pandas. These findings introduce new insights

into red panda distribution across both protected and non-protected areas, revealing distribution hotspots affected by anthropogenic pressures. Identifying conservation priorities within these areas provides valuable guidance for conservation agencies to improve their approach to strategies that include both Protected Areas (PAs) and non-Protected Areas (non-PAs).

Flapping in the Storm: Tradeoffs between Dewlaps & Hurricane Adaptation in *A. sagrei*

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Abstract:
Signals play an important ecological and evolutionary role in how organisms interact and reproduce. Honest sexual signals often come with fitness costs, which can lead to morphological tradeoffs. *Anolis sagrei*, or Brown anoles, and other anole species have a very distinctive signal, the dewlap. How may variation in dewlap area correlate with other aspects of morphology, especially in response to anthropogenic change? For example, anoles' toes and limbs are essential to their ability to cling to their perch; a key skill to surviving extreme weather events. Questions like these become more relevant as hurricanes increase in severity and frequency, natural selective pressures have increased, and some species have undergone rapid evolution. This has resulted in changes to their morphology, like an increased toe pad area. Due to the supposed nature of the dewlap as a sexual signal, it could result in a morphological tradeoff that compromises the anoles' ability to adapt to extreme weather, as sexual selection and natural selection act on different traits. To what extent do the dewlap area and coloration correlate to clinging ability? We explored these relationships using experimental clinging tests under high winds and morphological assessments using photography and X-rays. These showed that the dewlap area correlates significantly with snout-vent length, but not with other morphology. Certain bones in the forelimbs were correlated to clinging performance. Insights into anole adaptations and fitness during increasingly devastating storms could have conservation implications for more threatened reptile species and show how signaling is affected by the Anthropocene.

Hatch Success in a Herring Gull Colony on an Urban Green Roof

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Abstract:
Urban areas near water pose challenges for waterbird colony formation and nesting due to habitat loss. As a result, various waterbirds, including gulls, frequently resort to utilizing rooftops as an alternative nesting habitat. The largest green roof in New York City, the Jacob Javits Convention Center, provides a habitat for a large Herring Gull colony, which includes approximately 150 nests on the roof each year. Since 2014, NYC Bird Alliance has been working with the Javits Center to monitor this Herring Gull colony and their breeding behavior on the roof. While nesting on a roof may mitigate common threats which affect nesting birds and their young (e.g., disturbance from humans, terrestrial predators, and high-tide flooding), there is currently little known about Herring Gull productivity in a green roof setting. We aim to assess nest productivity within the colony through clutch size, hatch success, and total chicks fledged for nests distributed across the sedum rooftop. We examine how nest placement on a roof may influence productivity by tracking parameters including sun exposure, distance from the roof edge, distance to nearest nest, and nest density around each nest. We compare productivity from the Javits green roof colony to historical Herring Gull nesting colony data in more “natural" or “wild” habitats. Our results provide insight into the benefits of using green rooftops as a novel system for preserving Herring Gull nesting habitat and improving nest success for at-risk waterbirds, and can inform conservation and management strategies in urban areas using green roofs.

Influence of Agricultural Land Use on Bird feeding Guilds in Lower Gangetic Plain

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Abstract:
Despite being considered the foremost driver of declination of terrestrial biodiversity, agricultural fields are becoming refuges for a wide array of species of global concern including birds. Combining biodiversity conservation and ecosystem processes with economic productivity in the agricultural system is now proven to be an integral part of conservation science. Feeding guild of cropland birds and their association with different agricultural land uses were studied in six agricultural landscapes situated in 500m buffer areas of six remnant forest patches in the lower Gangetic plain of West Bengal from July 2022 to May 2023. The result of canonical correspondence analysis showed (all canonical axes $F=2.934$, $p=0.002$) that the foraging behaviour of birds was in sync with their habitat, which in turn demonstrated the extent of resource use in that habitat. The findings suggest that the agricultural landscape can sustain and support

diverse feeding guilds of birds over the long term if some small-scale measures are implemented such as minimizing the proportion of fallows, maintaining intercropping and crop rotation systems, and preventing further conversion of arable lands into human habitations.

Species Distribution Modelling for Medicinal/Culturally Significant Plants in Rwanda

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Abstract:
Species overexploitation poses a critical threat to biodiversity, particularly in the Global South where reliance on natural resources is substantial. In Africa, a portion of the population relies on medicinal plants for primary healthcare. With Africa's escalating population growth, there is an urgent need to understand the potential consequences on medicinal plant species. Therefore, this study aims to address this concern by modeling the potential distribution of 14 medicinal and culturally significant native plant species in Rwanda. Using spatial occurrence records obtained from the Global Biodiversity Information Facility (https://www.gbif.org/), and climatic predictors downloaded from WorldClim (https://www.worldclim.org/), we fitted species distributions models (SDMs) using maximum entropy and bioclim envelope algorithms in the dismo R package. Model performance was evaluated using both area under the curve (AUC) of the receiver operating characteristic plot and Boyce's Index. High-performing models were integrated into weighted average ensemble models to predict potential geographic distributions of each of the 14 species within Rwanda. The predicted suitable areas were refined by excluding urbanized and degraded areas, providing a comprehensive overview of habitat suitability for each species. Jackknife method was used to assess the contribution of the predictor variables to the ecological niche, while the niche breadth of all species was calculated. The results of this study have significant application for conservation efforts in Rwanda by highlighting existential threats to medicinal plant species and identifying areas for conservation prioritization.

The hidden cost of ornamental trees: arthropod biodiversity across common genera

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Abstract:
City planners and property owners are increasingly focusing on biodiversity value and not just aesthetics when planting trees. However, few studies quantify the biodiversity of commonly-planted ornamental trees, especially compared to closely-related natives. The closest studies compare invasive to natives. Using Brooklyn's Green-Wood Cemetery as our study site — an arboretum with similar growing conditions and replicate tree specimens — we hypothesized that native trees will have more arthropod biodiversity and interactions than non-natives of the same genera. To test this, we examined leaves of three commonly-planted native and non-native tree pairs (maples, oaks, and lindens) and measured herbivory (percent consumed) and gall-forming arthropods (species and abundance). Supporting our hypothesis, native trees have either the same or greater herbivory and galling arthropods (species and abundance) than their non-native counterparts. As a control, we also examined leaf chemistry (C, N, and P) within tree pairs, but this does not explain these differences in biodiversity. The results are noteworthy as all non-natives examined here have been cultivated in the USA for hundreds of years, yet still have significantly fewer interactions with local biodiversity. Our findings should help decision makers, like park managers and property owners, choose native trees that will best promote urban biodiversity.

The Seeds and Fruits of South America Database

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Abstract:
When studying plant diversity, plant-animal interactions and ecosystem services, we require information on plant traits which can be difficult to find for tropical systems. Many existing databases lack details such as the uncertainty and sample size of measurements, which are essential for evaluating the reliability of reported values and understanding variations within and among species. To address this, we have created the Seeds and Fruits of South America database on GitHub. The database, which stemmed from a systematic review on mammalian seed dispersal, includes the native ranges, fruit color, fruit type, number of seeds per fruit, and seed and fruit length, width, and mass of 660 mammal-dispersed plant species in South America. The database contains 624 native and 36 invasive species from 97 families. We collected data from published scientific literature, unpublished theses in English, Spanish, and Portuguese, as well as herbarium specimens from the online collections of the Missouri Botanical Garden, Kew Royal Botanical Gardens, and The Field Museum. We allow users to

contribute new information and corrections via a Google form, available in English, Spanish, and Portuguese. With this comprehensive dataset, the Seeds and Fruits of South America database serves as a valuable tool to promote higher reporting standards for botanical data and establish an accessible resource for researchers and practitioners in South America.

Secondary Rainforest Supports Similar Trophic Structures as Primary Rainforest

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Abstract:
Biodiversity of wildlife can be seen in interactions between species, such as predation. For species to interact, they must co-occur in space, but habitat loss may impact species use of forest segments, therefore impacting interactions and broader ecosystem health. We examined how species presence differed in old growth versus recovering tropical rainforest near La Selva Research Station in Costa Rica, monitoring mammal and avian presence with camera traps and acoustic recorders. We compared twenty-seven forest segments broadly labeled “Old-Growth” or “Secondary Forest” in accordance with previous land-use, and gathered microhabitat data on elevation, canopy cover, and vegetation surface area. In a Poisson regression, canopy cover, vegetation, and old growth forest type were significant positive predictors ($p<0.001$) of the number of individuals animals as well as the number of peccaries (large prey) visiting a site. However, only elevation was significant ($p<0.001$) in explaining differences in the number of carnivore visits between sites. Although the old growth forests may have more individual species and prey species visits, potentially due to food abundance, no difference in site preference for carnivores could signify resilience to disturbance and show that secondary forests can support healthy ecosystem function. Studies such as this allow for understanding habitat and resource use by animals and provide evidence for protecting forest while also elucidating the supportive role of recovering forests. Camera trap photos of jaguars from this project were successfully used by the field station in funding a new program aimed at jaguar conservation in the area.

Impacts of work intensity and land use on New York City urban forest restoration

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Abstract:
Green spaces, areas partially or completely covered in vegetation, are important yet threatened components of urban areas for biodiversity that require monitoring and maintenance. Although New York City is heavily dominated by urban infrastructure, its five boroughs contain a plethora of diverse green spaces. Forested natural areas are a critical green space component facing heightened stress due to anthropogenic and natural disturbances. In 2017, the New York City Department of Parks & Recreation (NYC Parks) and the Natural Areas Conservancy (NAC) conducted ecological assessments for these forests and established effective restoration, management, and maintenance strategies to incorporate into a Forest Management Framework. As part of this Framework, NYC Parks developed the Rapid Site Assessment (RSA), a protocol to document site condition change (e.g. native and invasive plant species prevalence) and evaluate completed project work recorded through the Natural Areas Management Application (NAMA). Analysis of RSA data from 2021 indicated a positive relationship between higher work intensity levels and better project outcomes. My study will rely on updated RSA protocols and the impact of work intensity and land use on project outcomes. I will also examine Coefficients of Conservatism, values evaluating plant species' degradation tolerance and endemicity, in informing future maintenance strategies. Given the dynamic nature of NYC Parks' forested natural areas and their continued high anthropogenic exposure, this research will contribute to ongoing monitoring efforts, improve conservation strategies, and inform future management.

Modeling Forest Use by Ecotourists and Local Communities in Andasibe, Madagascar

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Abstract:
The development of Protected Areas (PA) and subsequent ecotourism is a common strategy to conserve endangered species and fragile ecosystems while enriching local economies. In Madagascar, PAs are crucial for the protection of the many critically endangered species endemic to this biodiverse island, including lemurs, fossa, and a large range of reptiles and amphibians. Communities surrounding these PAs can become reliant on ecotourism revenue to supplement their lost access to PA natural

resources. However, ecotourism is widely recognized as an unsustainable practice given political instability and epidemics, including the recent COVID-19 pandemic. This research project encompasses five years of camera trap data (2017-2021) of three PAs in Andasibe, Madagascar: the Analamazoatra Special Reserve (ANZ), Mitsinjo Community Forest (MIT), and VOI Community Forest (VOI). Using this data, we modeled occupancy to answer 1) how do residents use forest trails before, during, and after the shutdown of international tourism in 2020? and 2) what contributes to this variation in forest use compared to tourist forest use? Across 4305 trap nights from 2017-2021 at 24 camera trap sites, our models revealed that resident occupancy increased during and after the pandemic as tourism decreased. Factors such as minimum distance to the road, ANZ park entrance, large body of water, and nearest lemur groups were found to contribute significantly to this variation. Ultimately, these findings underscore the potential displacement of local communities from natural resources and the critical need for sustainable ecotourism practices to ensure both human welfare and wildlife protection.

Examining the impact of flashing lights on livestock predation

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Abstract:
Predator attacks on livestock have negative impacts for both human and ecological communities. Large carnivore populations in Africa are declining from retaliatory or pre-emptory killing due to conflict a primary driver of this decline. Livestock are vital sources of income and cultural significance for pastoralist communities in East Africa and predation can result in substantial financial & livelihood losses. There are widespread efforts to improve human-predator coexistence in communities such as through education and modification of livestock enclosures. The addition of flashing LED lights, commonly referred to as 'Lion Lights,' on the outside of enclosures is one such potential solution to deter predators and improve coexistence.
The Kenya Wildlife Trust selected 60 households in southwestern Kenya, near the Masai Mara National Reserve, that were impacted by predation to investigate the impact of flashing LED installation on predation rates. Half, or 30 randomly selected households, received flashing LEDs in July 2021, the other 30 received nothing. Ten months later, a survey found significantly reduced predation rates of cattle, sheep, and goats in those households that had received flashing LEDs compared to those without lights. Although LEDs did not eliminate predation, and >¼ of the solar-powering flashing LEDs had

already failed, the lights were viewed as a success by the community. We compare our results to other studies. This research seeks to inform communities that struggle with large predators of a possible treatment method.

A qualitative study of climate change concerns and coping mechanisms among students

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Abstract:
Informed by the principles of Planetary Health, this study delves into the critical relationship between the natural world and human health, particularly focusing on the broader impact of climate change on mental health, especially among youth. Despite the growing recognition of this issue, there remains a dearth of research addressing the mental health concerns of youth in relation to climate change and their coping mechanisms, hindering our understanding and the development of effective interventions. Using a self-reflective qualitative methodology combining journaling and semi-structured interviews, the study focuses on students living in the Himalayas. Beyond mental health, it explores the intersection of nature conservation and well-being, examining the mental health costs of environmental degradation. The research will be conducted in the summer of 2024 at Woodstock School with a goal of providing insights that contribute to both individual well-being and environmental sustainability, shedding light on the role of self-reflection in qualitative research as a preliminary step for addressing climate change concerns among youth.

Understanding the ecological impact of reintroduced European Bison in Romania

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Abstract:
Rewilding efforts, the translocation of wild species to restore ecosystem function, are becoming an increasingly common conservation strategy. European bison (*Bison bonasus*) went extinct in the wild in the early 20th Century. Reintroductions have occurred across the continent in recent years with the goal of helping the species recover and as a candidate for rewilding. In the Southern Carpathians of Romania, a population of ~50 bison was reintroduced starting in 2019, of which ~17 have GPS

radio collars. The goal of this work is to leverage space use intensity data to evaluate the impact of translocated bison on recipient ecosystem and habitat. Using the radio telemetry data, we constructed home range estimates using Kernel Density Estimation (KDE). Home ranges varied widely, between 1.1 and 160.1 km2 for 95% KDE. Using these home range estimates, we developed a monitoring protocol to assess habitat change across a gradient of space use intensity in forested areas, forest regeneration habitat , and pastures. In Summer 2024, I will visit 45 3x3 m plots and measure habitat change metrics, such as structural heterogeneity, soil pH and compactness, canopy cover, understory density, and other indicators of habitat and ecosystem change resulting from European bison rewilding. These data will serve as a baseline for future researchers to track how the population of bison in the Southern Carpathians influence their environment.

A Cross-Disciplinary Approach for Creating a Data Tool for Teaching Ecology

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Abstract:
The need for engaging educational tools has surged, especially after the COVID-19 pandemic. The OCELOTS network addresses this by developing interactive tools for understanding ecological and taxonomic concepts. Our project created an online tool for classifying beetle species based on morphological and genetic traits. This tool supports various datasets and educational modules, integrating morphological, functional, and phylogenetic taxonomy methodologies. The tool's development involved a cross-disciplinary open-source approach, uniting biologists, software developers, and pedagogy specialists. Key functionalities include image sorting based on morphological similarities, DNA sequence sorting for phylogenetic analysis, and matching thermal tolerance data to functional taxonomy categories. We adapted algorithms from biodiversity databases and educational modules, emphasizing beetle datasets curated by Carlos Garcia-Robledo. Preliminary tests showed robust functionality. Users successfully sorted beetle images into species, aligned DNA sequences to identify cryptic species and correlated thermal tolerance data with taxonomic groups. The tool's interface provided intuitive navigation and real-time feedback, enhancing engagement

and learning. Our research enhances understanding of beetle taxonomy and integrates digital tools with biodiversity education. The tool's versatility in handling diverse datasets shows its potential for educational and research applications. This open-source, co-creative process prepares new researchers for biodiversity assessment and conservation, demonstrating the effectiveness of cross-disciplinary efforts in developing advanced learning tools.

Consequences of frugivorous mammal extinction on plant traits.

Sasha Koulakova, Leon Lin, Ariek Barakat-Norford
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Abstract:
Mammals provide a unique ecosystem service due to their ability to disperse seeds long distances and manipulate large and difficult-to-open fruits. A large body of literature exists that demonstrates the effects of large mammal loss on the dispersal of large-seeded plants. In this study, we expanded to other fruit and seed traits, including fruit and seed color, type, size, and number of seeds per fruit, and we asked how the loss of threatened or large mammals would affect the dispersal of plants with these traits. To answer this question, we conducted a systematic review of seed dispersal data for 21 mammal species selected from a list of frugivorous mammals in the Orinoco Region, which lies between the Andes Mountains and the Amazon, in order to represent mammals across Northern South America. For each of the six plant traits, we created an unweighted bipartite network to represent the links between the traits and mammal dispersers. We ran two extinction scenarios where we either removed threatened mammals, or large mammal dispersers. Then, we observed the proportion of links lost for each category of plant trait (e.g., small, medium, and large fruits) with each extinction scenario. To see if the change is significant, we permuted the network and recalculate the proportion of links lost 10,000 times. As the plant database is being finalized, the results are forthcoming this summer. This study will improve our understanding of the impact that mammals have on seed dispersal and anticipate what may happen to plant communities and defaunation.

Skunk cabbage on an urbanizing planet

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Abstract:
Cities exhibit characteristic abiotic changes, such as urban heat island (UHI) effects, and biotic changes, such as shifts in phenology and in species composition. This research focuses on the urban ecology of eastern skunk cabbage (*Symplocarpus foetidus*). This amazing plant flowers in mid-winter and can raise its body temperature ≤35ºC above ambient—the plant kingdom's most extreme example of thermogenesis. Working at sites in and around New York City, we have four main questions:
I. Does urbanization impact skunk-cabbage distribution? We use community science data to document where it grows along an urbanization gradient.
II. Do plants in more urbanized sites flower and fruit earlier? Community scientists are helping us monitor plants.
III. Does urbanisation alter thermogenesis? We (1) measure the temperature difference between floral chambers and ambient air and (2) use qPCR to measure the activity of AOX, the main thermogenic gene.
IV. Which arthropods pollinate skunk cabbage, and does the pollinator guild change with urbanisation? We collect and sequence environmental DNA (eDNA) from inflorescences.
By elucidating how eastern skunk cabbage responds to urbanization, this project is conservation relevant. It may help predict this species' persistence at the southeastern limit of its range, where it is endangered. Because eastern skunk cabbage is a good indicator of ecosystem integrity in forested wetlands, this research will inform land-use decisions for these habitats in cities. And the ecological roles and ecosystem services of animals, including bees and black bears, may depend on conserving key food plants, including eastern skunk cabbage.

Increased bird abundances over 30 years in an extensive commercial forest landscape

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Abstract:
Forest alteration through commercial forestry is implicated in continent-wide bird declines, but this may be region- and bird-community-specific. We replicated an extensive study of forest bird populations and habitat that we conducted 30 years ago in a 238,000ha commercial forest landscape in northern Maine. This landscape is at the heart of both the largest tract of undeveloped forest east of the Mississippi and the largest globally Important Bird Area in the contiguous U.S. We used timber company

stand maps to stratify breeding-season bird surveys across nine major forest types, and collected detailed information on the vegetation structure and composition of each survey site. These data allowed us to assess change in bird densities among forest types, landscape-scale abundances over time, and habitat associations at coarse and fine scales. Surprisingly, 26 of the core 47 bird species in our assemblage significantly increased in abundance; 15 of these 26 had declined regionally and 16 continentally over the same time period. Additionally, most expected mature-forest species occupied wider niches on our focal landscape than in other regional commercial forest. Bird densities shifted widely among forest types over time, and nearly all species showed signatures of either coarse or fine habitat plasticity. This suggests that Maine commercial forests may be providing higher habitat quality than others in the region, and that plasticity plays an under-appreciated role in shaping boreal bird assemblages over time. We hypothesize several nonexclusive mechanisms to explain these trends, and make management recommendations for our commercial and conservation partners.

Marine Debris and Microplastics in Coastal Environments of Connecticut

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Abstract:
The primary goal of our study is to assist with beach clean-up efforts in Connecticut while participating in NOAA's Marine Debris Program (MDP). According to NOAA (2024), the most common types of marine debris are cigarette butts, derelict fishing gear, food wrappers, and plastic bags. We adhered to NOAA's MDP criteria, using randomized transects to determine areas of observation and to collect debris. We measured and weighed each sample, entering the data in the NOAA's MDP database. Another goal of our study is to determine the concentration and types of microplastics in the Thames River, Connecticut. Microplastics are plastics not exceeding 5 mm (Isaac et al. 2021). A manta trawl net comprised of a 300-micrometer sieve codend was used. Water temperature, pH, and dissolved oxygen were collected with a YSI. A dissecting microscope was used to inspect the samples and separate suspected microplastics from organic matter. Each microplastic was measured with a digital caliper. Samples were analyzed using a Fourier-Transform Infrared Spectroscopy instrument. Preliminary results indicate that fragments were the most common category of microplastics, with Low Density Polyethylene (LDP), Low-Density Polypropylene, and Polyethylene being the most prevalent chemical types. Numerous user plastics are composed of LDP such as

bottles, films, wrappers, and bags (Kadac-Czapska et al. 2023). The average concentration of microplastics in the Thames River was 0.0060 particles/m3, which is lower than in many other estuaries. Understanding the distribution and types of microplastics and other marine debris is essential to developing policies that protect our marine environment.

A re-analysis of Hawksbill sea turtle *(Eretmochelys imbricata)* population connectivity in the Caribbean

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Abstract:
As with many marine species, it is often unclear which physical properties affect the spatial organization of nesting populations of sea turtles. This can be problematic for endangered species since areas of habitat protection are often delineated by geographical characteristics such as rivers, treating them as natural boundaries. In this study we use a landscape genetics approach to compare population structure of green (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricata*) sea turtles and coastal geography in two different regions of northeastern Costa Rica: the Tortuguero region and the Pacuare region. In both regions, changes in habitat protection status and resources are delineated by river mouths, but management lack any genetic assessments of the relationship between sea turtles nesting to the north and south of these river mouths. In this study, we use a fully non-invasive method to sample nests throughout these two regions. Nests are excavated at least two days after hatching, so that all viable hatchlings have already exited, and any post-hatching materials left in the nest (eggshells, dead embryonic tissue, yolk, etc.) are sampled. This work strives to bring a field of conservation that has typically relied on a single mitochondrial gene region into a next-generation sequencing context using a 2bRAD sequencing approach which works with fragments as small as 33bp, making it optimal for degraded, non-invasive samples. Outcomes of this study may provide crucial information about local population structure that will help inform future management decisions.

What Role do ‘Sea Lion Shows’ Have in Promoting Pinniped Conservation?

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Abstract:
Informal education facilities are places that strive to promote conservation efforts for threatened species by providing visitors with educational experiences and interactions with animals. As such, aquariums and zoos are crucial for fostering knowledge about wildlife conservation, especially in urban environments such as New York, where community members may not often engage with local wildlife. One of the most popular exhibits at any aquarium is the sea lion show, where the public sees the animal care team/trainers working hands-on with these pinnipeds. A major goal of the aquarium for these performances is therefore public education and outreach. While facilities attempt to promote conservation education through exhibits and signage, these traditional exhibit designs are non-immersive, and visitors do not typically engage with the educational content. Therefore, it is critical to utilize engaging opportunities, such as a show with live animals, to connect with the public in the hopes for long-term education and preferably positive behavior change regarding conservation efforts. In this study, the Center for the Study of Pinniped Ecology and Cognition (C-SPEC), an organization that seeks to educate individuals on the behavior of pinnipeds, the effect of anthropogenic activity, and habitat conservation, surveyed the public at the Long Island Aquarium before and after experiencing the sea lion show, to better understand what information is being learned. This data will be used as a feedback loop into the design of the show/narration to ensure the best results given this brief window of time to engage the public about pinnipeds and conservation.

Pro-Environmental Behavior and People of Color in NY - Drivers, Barriers & Links

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Abstract:
Pro-environmental behavior (PEB) refers to actions that benefit the natural environment. Amid a global climate crisis with severe consequences for global biodiversity, the study of PEBs is increasingly prominent and necessary. The literature reveals that PEB studies rarely include People of Color (POC) living in western, educated, industrialized, rich, and democratic (W.E.I.R.D.) countries, even where POC constitute a demographic majority. We are examining the motivators of PEB among POC living in Brooklyn, New York City (where POC are a numerical majority). We are using the Theory of Planned Behavior (TPB) as a conceptual framework and augmenting it by considering the role of perceived access to urban green-spaces. In this mixed-methods study, we are using qualitative insights from focus group discussions and semi-structured interviews to craft a quantitative survey that tests the main tenets of the TPB (attitudinal, normative,

and control beliefs) and urban green-space access with respect to PEB. Structural-equation modeling will allow us to determine whether our expanded TPB model explains a significant proportion of the variation in respondents' PEB. If so, our findings can inform interventions to enroll marginalized stakeholder groups in conservation and sustainability initiatives, including the management of urban green-spaces.

Tightroping Trails: Urban Edge Effects May Shape Coleoptera Populations in NYC

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Abstract:
In urban landscapes, human influence on ecosystems is increasingly evident. Research indicates selection pressures may drive species divergence within urban populations. The Anthropocene underscores the importance of recognizing ecosystems in densely populated regions, offering crucial wildlife experiences for marginalized communities. Studying specialist species and their habitats provides insights into the influencers shaping urban biodiversity. Ecotones, influenced by edge-effects, play a pivotal role in species distribution and dynamics, especially in urban settings where forest patches harbor high biodiversity compared to built surroundings. While the broader impact of urbanization on flora and fauna remains understudied, investigating edge specialists can shed light on edge effects and highlight the necessity for further research. Although charismatic fauna often dominate urban ecology research, notable insect events like the cicada emergence and increasing spotted lanternfly rates in urban centers underscore the importance of studying insect patterns for ecosystem health and science communication. Despite urban forests traditionally being seen as impermeable boundaries, there is potential for the vibrant edge effect depending on study species. Given insects' vulnerability to urbanization and climate change, they serve as ideal subjects for studying population divergence in urban areas. Our survey on *Cerambycidae*, economically and ecologically significant, aims to determine if these populations are adapted to local conditions in New York City parks or exhibit latent phenotypic plasticity through initial urban park transect surveys.

Estimating Hellbender Population Size Through Capture-Recapture Surveys

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Abstract:
Hellbender salamanders (*Cryptobranchus alleganiensis*) are large, aquatic amphibians

reliant on pristine freshwater ecosystems in eastern North America. Populations have declined significantly (up to 80%) in recent decades due to habitat degradation and other anthropogenic influences. Effective conservation strategies rely on accurate population assessments, yet estimating hellbender abundance is challenging due to their cryptic behavior. Capture-recapture studies offer a robust method for estimating population size, providing crucial data for conservation management. The goal of this study was to estimate the population size and understand the dynamics of hellbender salamanders within two Pennsylvania watersheds using capture-recapture methods. Over 3 years, we captured individuals through repeated checks of 150 artificial nest boxes deployed at 7 stream reaches (100-200 m in length). Each captured salamander was injected with a PIT tag before release, allowing for subsequent identification during recapture events. We found a total of 84 unique individuals. Our capture-recapture models show that the two watersheds had different hellbender abundance (29±2.85 and 69±5.25 individuals), and that recapture rates varied seasonally. This study is the first to use capture-recapture models based on minimally invasive methods to estimate hellbender population size, contributing valuable data for conservation management strategies. Understanding population trends and demographics is fundamental to preserving these iconic amphibians and their freshwater habitats.

Diversity in Agroforestry: Aligning Social and Ecological Sustainable Development

Sophia Roberts
Yale School of the Environment

Abstract:
Rapid deforestation continues to threaten tropical forests, essential for their ecosystem services including unparalleled levels of biodiversity and carbon sequestration. A leading cause of this land cover change is driven by agricultural commodities, but agroforestry offers a restorative solution by integrating trees to promote landscape health and yield marketable products. Although agroforestry offers well-documented benefits, the high cost associated with transitioning from conventional farming practices impedes its widespread adoption. While external funding via payments for ecosystem services (PES) markets presents a promising opportunity to expand agroforestry, limited monitoring strategies and the need for context-based support for farmers still hinder the success of these restoration efforts. In collaboration with the local organization Third Millennium Alliance (TMA) in the Pacific Forests of Ecuador, my research uses remote sensing to enhance ecological monitoring with a machine learning-based tree species classification model. This classification is based on ground-validated tree identification and aerial drone imagery. With these geospatially

measured diversity metrics, I then investigate the influence of social and geographic factors on tree diversity across the 37 farms supported by TMA. My research aims to assess the relationship between tree diversity and variables such as proximity to roads, elevation, and land-steward gender. While preliminary results are still underway, this study highlights the importance of biodiverse agroforestry systems in preserving forest integrity and fostering resilient communities for a more sustainable future.

Are chipmunks interchangeable? Assessing functional ecology through fungal dispersal

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Abstract:
In an era of unprecedented environmental change, biodiversity conservation is critical to confer ecosystem resilience. In the Lake Tahoe Basin (California, USA), four sympatric chipmunk species are instrumental in supporting this resilience. Chipmunks are important members of the forest ecosystem as known consumers and dispersers of ectomycorrhizal fungi (ECM), which form beneficial mutualisms with conifer trees. However, species-specific chipmunk-ECM assemblages are not well described, likely due to prior studies grouping chipmunks as functionally interchangeable. This study investigates the functional diversity of this system using DNA extracted from fecal samples and focusing on the fungal internal transcribed spacer (ITS2) region. I apply next-generation sequencing methods to determine the fungal diversity associated with each chipmunk species. I use QIIME 2 to analyze amplicon sequence variants and use a PERMANOVA to identify patterns in species associations. This study compares four chipmunk species that break down into pairs based on habitat specialization, and I examine whether this has a significant effect on fungal associations. The Lake Tahoe Basin also recently experienced a high-severity wildfire that dramatically altered the landscape. Thus, the results of this study will not only help resolve chipmunk niches, but will also identify the role chipmunks may play in post-wildfire succession.

Passive acoustic monitoring of the Bornean Bristlehead across lowland habitats

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Abstract:
Indonesia is a global biodiversity hotspot that is facing serious threats from

deforestation and habitat loss caused by forest fires, industrial farming, timber concessions, and illegal mining. The Rungan landscape is a large unprotected mosaic forest in Central Kalimantan that is home to a rich fauna, including large populations of endangered apes and myriad rare endemic species. Our study uses passive acoustic monitoring to study the distribution of the endemic Bornean Bristlehead (*Pityriasis gymnocephala*) in three different forest habitats (kerangas, mixed swamp, and low pole peat) in the Mungku Baru Education Forest, a 5,000-ha area in the center of the Rungan landscape. Their populations are declining in Kalimantan's lowland forests, but there is a paucity of research and data on the behavior and ecology of this rare species. We manually reviewed and annotated 200 hours of sound recordings from 8 Swift recorders, collected between August 2023 and January 2024 to describe the spatiotemporal distribution of this species across the three habitat types. These data will be used to analyze seasonal patterns and habitat preferences of this enigmatic and culturally important species. These sounds will contribute to the open-access sound library that we are creating as well as support the development of machine learning detectors to support better monitoring of this species in the future.

Long-term monitoring of hornbill nesting behavior in a lowland rainforest of Sumatra

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Abstract:
Hornbills face high risk of extinction due to habitat loss and illegal hunting, which are exacerbated by their low reproductive output and their dependence on large trees as nesting sites. In Sumatra, Indonesia, little is known about their breeding behavior and nesting, which is important to plan effective conservation strategies. Here, we present the nesting season and nest-site characteristics of hornbills at Way Canguk Research Station, Bukit Barisan Selatan National Park, Sumatra, Indonesia. We monitored 35 tree cavities in two monitoring periods: 23 tree cavities between 2006 – 2009 and 20 between 2015 – 2018; and recorded the nesting activities of hornbills. We measured the characteristics of nest trees, nest cavities, and vegetation within 20-m radius of the nest trees. Of eight hornbill species known to occur in the study area, only four were found nesting during the study periods, i.e. Bushy-crested, Helmeted, Rhinoceros, and Wreathed Hornbills. We found that there was a considerable decrease in nesting frequencies between the two monitoring periods. Among the four species, there were

no differences in the height of nest cavities, diameter, and height of nest trees. All species preferred emergent trees and trees with big trunks as nesting sites. Most tree species that were used by hornbills for nesting also have high timber value, thus are vulnerable to the risk of illegal logging. To ensure the survival of hornbills, sufficient number of tree cavities that are suitable for nesting must be maintained.

Hot microbes at work! Protecting the environment by converting to waste to hydrogen

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Abstract:
Anthropogenic organic waste is being disposed into waterways, causing eutrophication and ecosystem collapse. Successful conservation of these ecosystems requires novel sustainable technologies. Here we present a novel waste-to-hydrogen process using a high temperature microorganism, *Thermococcus paralvinellae*. It has the potential to convert organic waste to hydrogen, a clean fuel, in a single process. It does this using a membrane-bound hydrogenase (MBH) that produces hydrogen from the breakdown of organics, and a membrane-bound formate hydrogenlyase (FHL) that produces hydrogen using a one-carbon compound called formate. The objective of our research is to determine how to optimize waste-to-hydrogen conversion using *T. paralvinellae* by enhancing MBH and FHL activities to maximize waste degradation and hydrogen production. We measured the growth rate and hydrogen yield of *T. paralvinellae* when grown separately on a sugar, formate, sugar + formate, and brewery wastewater to determine if addition of formate to waste enhances hydrogen production, and potentially improves waste degradation. Furthermore, we determined how the enzymes MBH and FHL behave under these growth conditions. The results showed that hydrogen production was stimulated by adding formate while the hydrogenases remained the same. The next phase of this project is to determine growth rate, hydrogen yield, and enzyme behavior of *T. paralvinellae* grown on brewery wastewater with formate. By optimizing this novel waste-to-hydrogen process, we are approaching environmental conservation through sustainable technology development, protecting waterways from eutrophication, and replacing fossil fuels with hydrogen.

Herring Gull response to human disturbance on an urban green roof

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Abstract:
Human-wildlife interactions are ever-increasing as urban development encroaches on natural spaces. As more natural space is lost, the need to create natural spaces in urban areas increases. Green roofs are a modern solution to habitat loss in an urban environment, hosting habitat for wildlife and a green space for humans to enjoy. The Javits Center in Manhattan, New York hosts a 6.75-acre green roof which has in recent years become a nesting site for a Herring Gull colony. Nesting gulls are known to be aggressive and swoop in on intruders near their nests, thus posing a threat to humans that need to access the roof for regular maintenance. We investigate if constant exposure to human disturbance tempers Herring Gull aggression on a green roof by comparing behavior and flight initiation distance between two sites on Javits' roof with differing amounts of human disturbance. We expect Herring Gulls who are frequently exposed to human disturbance to exhibit less aggressive behavior, leave the nest later, and return to the nest quicker when disturbed than gulls who do not experience frequent human disturbance. Previous studies have measured gull behavioral responses to human disturbance in land-based colonies, but there is little known about gull aggression on rooftops. As coastal development continues to lessen the amount of habitat available to nesting waterbirds, the use of green roofs as nesting sites will become more and more common. Understanding how nesting gull colonies react to consistent human disturbance on rooftops will provide insight into methods for conservation-based wildlife management in urban environments.

At the Edge of Anthropocene - Wildlife Conservation in Mojave Desert

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Abstract:
Life thrives on the edges within the Mojave Desert. Wildlife follows the washes formed by sporadic rainfall, driven by myriad instincts—to seek shelter, to seek mates—yet often confronted by barriers due to human development. Our project transcends traditional conservation efforts and strives to imagine the possibilities of human and non-human coexistence by exploring options for optimizing the "edges" formed by anthropogenic infrastructure. The project focuses on two species that inhabit the Mojave Desert - the Desert Tortoise (*Gopherus agassizii*) and the Mojave Tarantula (*Aphonopelma mojave*), which spend most of their lives underground and often remain invisible to humans. These species often live in association with the altered industrial landscape in the Mojave Desert, particularly in its western reaches marked by burgeoning clean energy initiatives. The proliferation of solar arrays, wind farms, and their ancillary infrastructure

elements presents both barriers and opportunities for these wildlife. Therefore, our project revolves around promoting wildlife connectivity by blurring the rigid edges forged by human-centric development and unlocking the hidden potential within these structures through design and policy recommendations. Ultimately, we aspire to envision a new conservation paradigm tailored to the unique challenges and opportunities presented by the Mojave Desert – a vision where coexistence thrives amidst the shifting sands of progress.

Microgeographic variation in amphibian hormonal response

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Abstract:
Amphibians are experiencing global population declines, with many species at risk of extinction. Disease related die offs, habitat changes, and shifting global temperatures induce increased levels of environmental stress in ectothermic amphibians. The adult wood frog (*Rana Sylvaticus*) exhibits extreme adaptations in overwintering, but larval stages are sensitive to disruption, desiccation, and disease. Tadpoles must undergo an intense process of development to complete metamorphosis. This process is driven by hormones, signaling metamorphic shifts; however, hormone levels also vary in response to environmental stress signals. We assessed microgeographic variation in baseline corticosterone and thyroid hormone levels across suburban and rural landscapes in CT. Sampled ponds had a variety of environmental stress factors including variation in temperature, drying, canopy cover, distance to road, and water quality parameters. Analysis showed no variation in hormonal response across larger landscapes (suburban vs. rural environments), but larger variation in hormonal response was evident across individual pond habitats. Mixed-effects regression modeling indicated significant pond level factors in determining tadpole level CORT response. Significant variation between pond sites within larger landscape types indicates that microgeographic factors at the pond specific level, modifying the microclimate, may be as important as landscape level changes for determining environmental stress response in developing amphibian populations.

Temperature Scaling of Animal Development

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Abstract:
Animal development is remarkably robust in diverse environments, enabling stable and reproducible outcomes within populations. This includes the ability to generate normal developmental outcomes across vast temperature ranges. Given the realization that human activities directly result in global temperature changes, there is a critical need to understand how biological systems generate stable outcomes in extreme environments and the limits of these systems to adapt. This project aims to probe how developmental gene regulatory networks (GRN) function and adjust to different temperatures using the genetically and experimentally tractable model organism *C. elegans*. We hypothesize that animals alter the timing of gene expression to generate robust gene expression. This hypothesis is bolstered by prior experiments that indicate that the pace of events is increased at higher temperatures. We aim to directly monitor the transcription of key developmental genes in real-time throughout development at different temperatures using fluorescent reporters and high-throughput imaging of live animals. We will focus on dissecting how the regulation of a conserved developmental clock generates the cadence of stem cell divisions and specifications at different temperatures. By directly monitoring how this clock controls features of developmental transcription (e.g., amplitude, duration, and phase), we can generate models for how temperature adaption normally occurs, where these GRNs will eventually break down, and what developmental properties are least likely to adapt to extreme environments.

Deforestation in Protected Regions in Madagascar from 2001-2022

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Abstract:
Madagascar has already lost 80% of its natural area with the rate of deforestation increasing every year (Suzzi-Simmons 2023) and is home to many endemic species. With the increased rate of deforestation, many of these animals are losing their homes and food sources which makes them endangered (Ralimanana et al. 2022). Protected regions in Madagascar exist, but deforestation rates within these regions are unknown. We used remotely sensed data from the University of Maryland Global Forest Change Database (Hansen et al. 2013) covering the years 2001 to 2022 to understand deforestation patterns in Madagascar's 121 terrestrial protected parks (UNEP-WCMC 2024). Forest was defined as vegetation over 5 meters with a 30m2 resolution and

classified by forest type (spiny thicket, humid, and dry deciduous) according to ecoregion (Vieilledent et al. 2017). On average deforestation is increasing, except for spiny forests, which shows a decrease in deforestation rate. Humid has the highest rate of deforestation at 7.7%; this is concerning as approximately 57% of all protected regions are humid forest. Although we did not test for deforestation causes, future studies could focus on factors such as proximity to cities, desirability of type of wood, economic pressures, and amount of rainfall. Limitations include inconsistencies in defined park boundaries from data sources, inability to ground truth, limited timeframe of data (starts in 2000). Based on our data, deforestation remains a persistent issue within Madagascar's forests. This suggests that stricter legislation should be enacted in Madagascar.

Energetic burden of endoparasitism on harbor seal (*Phoca vitulina*) hosts

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Abstract:
Parasites are omnipresent members of ecosystems worldwide and can be found living amongst all species across the planet. Endoparasites live within their hosts and typically subsist off of host tissue, blood, or by consuming a portion of the host's food as it moves through the host intestinal tract. These tactics result in a loss of nutrients and energy from the host to the parasite. By assessing energy flux between endoparasites and their mammalian hosts, the energetic burden associated with parasitic infection can be identified. Through quantification of energy lost from host to parasite we can generate a better understanding of the physiological effects of parasitic infection on a host. We dissected harbor seal (*Phoca vitulina*) intestinal tracts and isolated all parasites found within. Biomass measurements were obtained for both parasite and hosts and energetic burden of infection was quantified using the Metabolic Theory of Ecology. This research highlights for the first time the energetic burden of endoparasitism in a marine mammal host. Importantly, through developing this understanding of how hosts are affected by endoparasites, scientists and managers will be able to better direct resources towards the conservation of both parasite and host species in the future, as well as investigate new avenues of research into the complicated biological relationship between how nutrients and energy move between parasites and hosts in ecosystems worldwide.

Preserving Oakwell – Assessing Alternative Locations for Auxiliary Sports Fields

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Abstract:
The Oakwell Estate (Villanova, PA) is home to several mature-growth trees, and a wetland habitat. With development plans proposing to clear-cut trees for auxiliary sports fields for Black Rock Middle School, the localized ecological implications (and equally historical significance of Oakwell), coupled with national deforestation trends, warrant the need to consider alternative locations. This study measured pre-development environmental parameters and assessed sport field site suitability of Lower Merion Township. 1921 maps of the property were georeferenced to evaluate historic forest conditions and compared to modern inventories and high-resolution 3D drone imagery. Tree Canopy Cover data was used to analyze township tree patterns. Additionally, soil sampling was conducted across the property, and samples were analyzed for heavy metals using an Inductively Couple Plasma Mass Spectrometer (ICP-MS). Lastly, A multi-criteria decision analysis (MCDA), including tree canopy cover, slope, soil type, and distance to streams criteria, was constructed in GIS, to establish the suitability of township land for fields. Using the outputs of the model, alternative locations were determined. The results of the study found that Oakwell is only 39.04% (±16.27) suitable for sports fields. Tree canopy covers approximately 58.96% of the property but would be reduced to approximately 11.63% if clear-cut occurred. Heavy metals tended to be less concentrated near areas with tree cover and less impervious surfaces. Additionally, mean canopy cover in the township decreased by 4.2% over the last ten years. These parameters should be considered before deciding the ultimate fate of Oakwell.

Impact of Deer Herbivory on Plant Assembly Rule

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Abstract:
The biodiversity of local plant communities is closely related to the current ecosystem functioning, and the biodiversity of the communities is to a large extent constrained by the assembly rule. The assembly rule, as a constraint on the composition of local plant communities, needs to take into account the influence of various factors, including biotic and abiotic factors. To date, the influence of abiotic factors on the assembly rule remains unclear. In the face of global climate change and increasing environmental disturbances, understanding the influence of abiotic factors on assembly rules can help

us to understand the ecological diversity of plant communities and the changes in ecosystem functioning involved. This study intends to investigate the effects of deer herbivory as an abiotic disturbance factor on plant assembly rules by examining the phenomenon of deer herbivory in Black Rock Forest. We measured and compared the functional diversity of plant communities with and without deer herbivory to understand the extent to which deer herbivory alters local functional diversity and ecosystem function. We expect deer herbivory to act as a strong disruptive factor that supports a particular plant community composition (from a functional perspective).