PSGB Annual Meeting
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Cardiff

Abstracts

Plenaries

Primatology: strengths and weaknesses of our discipline

Prof Joanna (Jo) M Setchell[1]

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I will reflect on the strengths and weaknesses of our discipline, based on what I have learned from my own studies of primates, mentoring other primatologists, as Editor-in-Chief of the International Journal of Primatology, and as a member of primatological societies including PSGB. Primatology is a taxon-based discipline, allowing us to draw on theory and methods from diverse fields. The variability in our research interests, study animals, and research sites means that there are no 'off-the-shelf' protocols for how to study primates. Asking good questions and designing appropriate studies to answer them are vital to produce high quality science. Primates are facing extinction, and to conserve them we need an evidence-base and an integrated biosocial approach. Finally, primatology has its roots in colonial endeavours and we must acknowledge ongoing colonial attitudes to collaborate more equitably. Doing so is not a simple task.

Behavioural and cognitive immunity in primates

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Risk perception — an individual's sensitivity to potential threats such as disease, predation, or competition — has shaped the physiology, cognition, and behaviour of animals for millions of years. While much research has focused on responses to lethal threats (e.g., predators), only recently have we begun to understand how animals, particularly our closest primate relatives, detect and mitigate disease risk. Disgust, a neurobiological and evolutionarily conserved system, underpins a key form of behavioural immunity — a set of avoidance mechanisms that protect hosts from infection along physiological defences. Through a series of experimental and observational studies, I addressed five questions: (1) What triggers avoidance in non-human primates (NHPs)? (2) Does disgust confer health benefits? (3) Is disgust learned? (4) Are there cognitive markers of disgust? and (5) How can disgust be applied beyond the laboratory? Our findings reveal that (1) NHPs show aversion to sensory cues linked to biological contaminants and infection risk; (2) individuals avoiding contaminated food exhibit lower parasite loads; (3) disgust is partly learned and may interact with physiological immunity; and (4) different types of risk (infection vs. predation) engage distinct cognitive pathways. Together, these results support the concept of behavioural and cognitive immunity as an adaptive interface between emotion, cognition, and health. Finally, I explore how this framework can be applied across contexts. While disgust-based avoidance has been used in public health and consumer choice, its potential extends to wildlife management, conservation, and animal welfare. Building on this theoretical foundation, my current projects investigate how leveraging the protective phenotypes of NHPs and humans may reduce harmful human–wildlife interactions. I will introduce several applied contexts and discuss key challenges in translating emotional and cognitive mechanisms into practical conservation tools for primates.

Jane Goodall Memorial Lecture

Jane Goodall: The Icon and the Person

Richard Wrangham[1]

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Jane Goodall's studies of chimpanzees, her concern for all living things, and the profound influence she has had on both scientists and the general public, leave no doubt about the exceptional nature of her achievements. But in her own mind there were two different versions of herself, the icon Jane and the real Jane, and she expressed puzzlement as to why the icon Jane inspired such intense and passionate worldwide approval. I will review Jane Goodall's career as a primatologist, conservationist, humanitarian and setter of ethical standards, and ask if there is really any basis for her being puzzled.

Workshops

Ethograms for captive primates: what works and what can we do better?

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Accurate behaviour identification and monitoring in captive primates is important for many reasons, including welfare monitoring, assessing the effectiveness of interventions, and ensuring research outcomes are reproducible. To monitor behaviour accurately and in a reproducible way, having a high-quality ethogram is essential. Despite this, existing ethograms for many species lack breadth and/or depth, and definitions of behaviours are often vague. This leaves room for ambiguity, and may increase inter and intra-observer, as well as inter-study, variation. This workshop aims to identify the common issues that primate behaviour researchers experience when using and adapting existing ethograms for their own studies, before considering what we can do to improve the landscape moving forwards. The workshop presenters work with rhesus macaques and have faced their own difficulties when trying to create a comprehensive and reliable ethogram for this species. We will begin by sharing our experiences, before asking the audience to share their experiences with their species of interest. Participants will consider what problems they have experienced, what works well and what doesn't work, and what is currently lacking for those species. The second part of the workshop will be solution oriented. In groups, participants will brainstorm ideas for how we can improve going forwards, both on an individual level as well as a community. The workshop hosts will use the outputs from the session to generate a set of recommendations for producing effective ethograms, which can be shared with PSGB members.

Designing impactful field trips for primatology and conservation students: an interactive workshop to explore opportunities and challenges

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Field trips play a vital role in primatology and conservation science education, enabling students to develop both technical skills (e.g., species surveying, scientific methodology) and transferable competencies (e.g., communication, leadership) in real-world contexts. Immersive problem-solving afforded by field trips also promotes higher order thinking that contextualises classroom learning. International experiences have the potential to further foster cultural competence, empathy, and collaboration skills essential for addressing global environmental challenges. However, legitimate concerns around sustainability, costs, inclusivity, access, and ethics require organisers to ensure such trips provide genuine and equitable learning opportunities. This interactive workshop will provide an opportunity for everyone involved in field trips (teachers, students, field teams, those working in NGOs and charities etc) to identify and discuss opportunities and challenges to effective and impactful fieldwork learning. It will also provide a space for participants to explore and share examples from their own experiences. The aim of the workshop is to open a discussion around the opportunities and tensions of designing and delivering fieldtrips, that will contribute to best practice in our field.

Posters

Retrospective Analysis of Pathological Findings in Captive Callitrichid Species

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An increasing number of retrospective mortality studies have been conducted in recent years for a variety of taxa. These studies have been shown to offer valuable insights into health trends and to provide details of diseases within captive animal populations. For the small South American primates of the callitrichid family such research has been limited. The European Association of Zoos and Aquaria's Callitrichid Taxon Advisory Group has endorsed this study which aims to compare the morbidity and mortality of captive callitrichids across five genera (ten species). Health data including *postmortem* records are being collated from EAZA *Ex Situ* Program coordinators and holding zoos to allow for examination of prevalence and trends in disease. Association between age, sex and genus/species will be analysed with further consideration given towards the effect of season and region on disease. It is anticipated that the outcomes of this study will complement current husbandry guidelines in supporting species specific diagnosis, preventative screening and management and is likely to identify priorities for future research.

The effects of tourist presence on the activity budgets of Zanzibar red colobus monkeys (*Piliocolobus kirkii*)

Billie-Mae Jamie Fisher[1,2], *Patrick Allsop*[1,2], *& Alexander V. Georgiev*[1,2]

[1] *School of Environmental and Natural Sciences, Bangor University*
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Wildlife-watching tourism has grown significantly in recent decades and is often endorsed as a sustainable alternative to mass tourism. Despite providing important income for conservation-related activities, its impact on wildlife remains contentious. Primate-watching tourism in Jozani-Chwaka Bay National Park, Zanzibar, has been steadily growing since the 1990s, yet its effects on the endangered and endemic Zanzibar red colobus (*Piliocolobus kirkii*) remain underexplored. This study investigates the impact of tourist presence on the activity budgets of four groups of monkeys that ranged in similar habitat but varied notably in the amount of tourism they experienced. We measured tourist presence and colobus activity budget via 15-min instantaneous scans while following the colobus (>1,400 observation hours). Two of our study groups were rarely in the presence of tourists (0 of 39 and 1 of 37 observation days), while the other two groups were visited by tourists much more often (20 of 44 and 37 of 38 observation days). Mean daily time spent with tourists reached 53% for the most heavily visited group (and up to 75% on some days). Comparing activity budgets between high vs low tourist-exposure groups, we found that colobus in the high-tourism groups spent more time travelling and less time resting. There were no significant differences in time allocated to feeding, grooming or other behaviours. Across all observation days, the daily percentage of time the monkeys were with tourists

was positively associated with feeding and travel time, and negatively with resting time. The linear association between tourist presence and activity budget metrics, as well as post-hoc between-group comparisons further suggest that tourism presence at moderate levels is not associated with drastic shifts in activity but it is only in the more extreme cases of tourist exposure that we see notable shifts in group behavioural profiles.

Primate Politics: Investigating sexual behaviour as a novel predictor of 'leave' vs 'remain' decisions in the natal group

Holly Fortune[1], Katarina Piponi[1] & Vincent Savolainen[1]

[1] Imperial College London

Whether an individual leaves their birth group (natal dispersal) or remains within it carries major fitness consequences. In social mammals, male dispersal is typically influenced by factors such as dominance rank, social connections and group demographics. However, the potential role of sexual behaviour – both same-sex (SSB) and different-sex (DSB) – has received little attention. SSB is often considered a Darwinian paradox due to its unclear fitness benefits, but SSB's relationship with dispersal could clarify its prevalence and function. Conversely, remaining in the natal group could influence sexual behaviour, offering further insight into SSB's adaptive role. This study examines both directions of influence: (1) whether sexual behaviour predicts male natal retention, and (2) whether natal retention shapes sexual behaviour. Using six years of behavioural and demographic data from semi wild rhesus macaques (Macaca mulatta) on Cayo Santiago, Puerto Rico, we provide the first analysis that incorporates sexual behaviour alongside established predictors of male natal retention. Dominance rank emerged as the strongest predictor of natal retention, with age, social connectivity, group size and sex ratio also contributing. Sexual behaviour did not predict dispersal decisions. However, the reverse effect was observed: philopatric males engaged in 38% more SSB than dispersers, while extended natal residence significantly reduced DSB. These results provide the first empirical link between SSB and male philopatry, supporting the hypothesis that SSB could help avoid inbreeding by redirecting sexual motivation away from female relatives. This finding provides new insight into the adaptive function of SSB in primates, reframing it as an evolutionarily stable strategy rather than a paradox.

Effects of sociality on the gut microbiome in wild chacma baboons (*Papio ursinus*)

Jemima Frame[1], Tamsyn Uren-Webster[1] & Ines Fürtbauer[1]

[1]Swansea University

The gut microbiome plays a crucial role in regulating host metabolism, immune function, and behaviour, and its composition can be partly shaped by social interactions. Close physical contact often is associated with more similar gut microbial communities, accompanied by shifts in the relative abundance of specific taxa. Such socially mediated microbial changes may have important health implications; however, the temporal stability or flexibility of host microbiomes is still poorly understood due to the coarse temporal scale of most studies. In this study, we investigate effects of sociality on gut microbiome composition in wild chacma baboons (*Papio ursinus*). We integrate gut

microbiome data from frequent faecal sampling with second-by-second accelerometer-derived grooming and GPS-based spatial data. Specifically, we examine (i) whether time spent in close proximity and/or grooming predicts greater similarity in gut microbiota composition within dyads, (ii) whether individuals that are more social exhibit higher relative abundances of specific microbial taxa, and (iii) whether, and at what rate, gut microbiome similarity and diversity within dyads change over time in parallel with grooming exchanges. Overall, this study provides unprecedented insight into temporal dynamics of sociality-microbiome relationships.

Investigating the Presence of Imaginative Capacities in Great Apes Using a Mime-Based Methodology

Charlotte Gannon[1], Paul Brown & Adriano R. Lameira

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Imagination is a fundamental cognitive capacity, supporting problem-solving, planning, and symbolic thought in humans. While observational reports suggest that great apes engage in behaviours indicative of mental simulation, such as tool use, play, and displaced communication, direct experimental tests of imaginative abilities remain scarce. This study investigated whether great apes (N = 29; Pan, Gorilla, Pongo) demonstrate imagination in a structured, three-step mime-based task. Steps increased in representational abstraction: visual shape matching (Step 1), hand gesture interpretation (Step 2), and mimed action referring to absent objects (Step 3). Each individual completed up to three attempts, and both research-experienced and research-naïve apes were included to explore potential effects of prior experimental exposure. Performance declined with increasing abstraction, with the lowest success in Step 3. Some improvement was observed between attempts 2 and 3 for Steps 1 and 2, suggesting learning of basic task demands, but not for the mimed step. Neither genus nor prior research experience significantly predicted performance. Only three individuals met the pre-defined passing criteria on two steps, and nearly half of subjects did not pass any step, indicating that while the task offers a structured framework for assessing imagination, evidence of imaginative processing in great apes was limited under these conditions. These findings highlight a gap between experimental task performance and observational evidence, suggesting that laboratory paradigms may underestimate apes' imaginative capacities. Mime-based methodologies offer a promising approach but must consider ecological, social, and cognitive context. Additional complementary preliminary data from a version of the study using a touchscreen protocol with Bonobos suggests that a methodological change in the presentation of the task does not improve performance.

The impact of anthropogenic noise on the howling behaviour of mantled howler monkeys

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[1] University of South Wales

The function of loud howls by mantled howler monkeys is heavily disputed and has been hypothesised to be for resource guarding, group cohesion, predator avoidance or sexual signalling. This species has a high behavioural plasticity and can occur in small forest fragments of human dominated landscapes

and therefore subjected to high levels of anthropogenic noise disturbance. In this study we compared vocalisations from Costa Rican Forest edges, the control forest, situated at the San Miguel research site on the western side of Cabo Blanco Absolute Natural Reserve has little to no anthropogenic disturbance, compared to those found within the towns of Mal Pais and Santa Teresa, situated outside the park which have high levels of anthropogenic noise, including but not limited to, traffic and construction. Vocalisations were recorded using audio moths as a non-invasive sampling method. Each site had 3 audio moth locations, recording from 4am to 7pm over 7 days. Preliminary results have shown that there is some evidence against differences in howling behaviour when directly comparing those which are subjected to high levels of anthropogenic disturbance and those with none. While the impact of habitat differences on mantled howler monkey vocalisations is documented, little is known about the influence of anthropogenic noise on their vocalisations.

The role of the body in multicomponent communication in semi-free ranging rhesus macaques

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[1] Nottingham Trent University

Primate communication is inherently multimodal and multicomponent, using a range of visual, auditory, tactile and chemical signals, sometimes simultaneously. Combining signals adds to the complexity and efficiency of communication, which has been proposed to be a unique evolutionary stepping stone towards human language. However, the role of the body in multicomponent signals has been largely overlooked, despite body position being a potentially salient signal of intention and/or action. This project aims to investigate the social function of multicomponent communication and the role of body position in the communication of rhesus macaques *(Macaca mulatta)*. Video data of the social interactions of semi-free ranging rhesus macaques collected via focal follows at Cayo Santiago Biological Field Station, Caribbean Primate Research Centre, Puerto Rico were coded in BORIS using a bottom-up approach. All facial movements (using MaqFACS), body positions, body movements and limb actions (using a newly developed coding scheme), as well as social variables such as social context, proximity to others and social orientation were coded. Analyses are planned to quantify the facial, vocal, gestural, body and combined signals produced as well as the contexts in which the signals occur in, to see what factors contribute to multicomponent signal use and to understand its function. Additional analyses are planned to investigate rates and types of signals in relation to individual characteristics (i.e., age, sex, dominance rank). Frequent multicomponent signal combinations involving a body position will also be identified to highlight the role of the body in communication. It is predicted that multicomponent signals will be used more during aggression, where uncertainty or ambiguity in the meaning of a signal could have negative consequences. The outcomes of the study will help us understand how communicative signals interact and will highlight the limitations of studies researching communication by focusing on one modality of signals.

Where We Should Be Looking for Panin Fossils

Jess Peers[1]

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The evolutionary history of the panins (chimpanzees, bonobos, and their ancestors) is poorly understood. This knowledge gap directly results from a critically scarce fossil record historically biased towards the East African Rift System (EARS), limiting our understanding of their broader biogeography and adaptations. To address this, a novel, data-driven methodology was developed to predict high-potential fossil localities across Africa for the last 5 million years. A multi-model framework was employed, integrating species distribution models for palaeohabitat reconstruction with key taphonomic factors influencing fossil preservation and discovery. Using machine learning algorithms (Maxent and Random Forest), a comprehensive analysis of environmental, geological, and biological datasets produced a continental-scale predictive map of fossil potential. Model validation demonstrated strong predictive performance (AUC = 0.872), with known African mammal fossil sites, modern human population density and topographical slope emerging as the most significant predictor variables for discovery. The final ensemble model consistently identified the African Great Lakes region as a primary hotspot, independently corroborating the location of the only confirmed *Pan* fossil from the Kapthurin Formation. Furthermore, a geospatial buffer analysis pinpointed novel and promising search areas along the Central West African coast in Togo, Nigeria, and Angola, directly challenging the traditional geographic focus of palaeontological research. This research provides a crucial first-pass filter that transforms the search for panin fossils from a speculative exercise into a strategic, data-driven pursuit, challenging the long-held geographical bias towards the EARS and identifying high-potential sites in Central and West Africa. The results demonstrate how computational approaches can overcome historical biases and efficiently target vast, under-explored regions. This predictive capability provides an essential tool for optimising fieldwork resources and maximising discovery potential. The breakthrough of new panin fossils is vital in resolving questions about their evolutionary adaptations and ecological tolerances, as well as those of our last common ancestor.

Orangutan cultural knowledge includes communication about past events

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[1] *University of Warwick*

Whether and how humans verbally report past events depends on the language we inherit culturally. Great ape cultures include population-specific call types (dialects) and variants (accents), and their vocal repertoires are composed of consonant-like and vowel-like calls, which wild orangutans combine to communicate about predator encounters that have occurred elsewhere and elsewhen. Whether conception of, and communication about, time depends on social learning, as it does in humans, is however extremely difficult to address empirically in nonhuman animals. Here, we performed predator-model experiments (n=59) across four free-living Sumatran orangutan populations (nind.= 32) in the largest logistical and experimental standardised effort of the kind, including two populations where individuals were first or second generation released rehabilitants – thus missing critical learning opportunities, but otherwise living in ecological conditions, genetically indistinguishable from their counterparts who were born and fully developed in the wild. Wild orangutans consistently display moderately delayed alarm calls (median 60-177s predator dependent); first-generation released individuals exhibited substantially longer delays, particularly to the albino model (median = 589s), while second-generation individuals exhibited more variable responses, including an unusually rapid call to tiger stimuli (median = 2 s). These results suggest that,

alongside call types and variants, the capacity to communicate about past events may be socially learned in orangutans. Findings support the view that abstract concepts such as time can be culturally acquired and vocally expressed in great apes, supporting an ape-human vocal-verbal evolutionary continuum.

5-minute talks

Crop-Foraging Behaviour and Population Viability Analysis in Sanje Mangabey (*Cercocebus sanjei*)

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Recent anecdotal reports from the Udzungwa Scarp indicate potential occurrences of crop-foraging behavior by the Sanje mangabey (*Cercocebus sanjei*). The Sanje mangabey is an Endangered and highly endemic primate species found only in two populations in Tanzania: one in the Mwanihana Forest and the other in the Udzungwa Scarp Nature Reserve. The species is already threatened by a declining population, habitat degradation, and fragmentation. Crop-foraging incidents in nearby villages may escalate human–wildlife conflict, which could further increase the threats faced by this species. The aim of this study was to investigate reports of crop foraging by Sanje mangabeys and other species in two focal villages, and to evaluate local people's perceptions of the different species involved. This will help assess the severity of the impact of crop foraging and the potential for negative actions taken in retaliation. In parallel, a preliminary Population Viability Analysis (PVA) was undertaken to assess the robustness of the species' current population. This analysis aims to evaluate the potential impacts of retaliatory killings on the survival of the Sanje mangabey and to determine whether such pressures could contribute to an extinction vortex effect.

Exploring primate locomotor diversity: the role of hindlimb muscle architecture and function

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Understanding relationships between muscle architecture and function is essential for interpreting locomotor diversity. Key parameters, including fibre length (FL), pennation angle and physical cross-sectional area (PCSA), influence force generating capacity, and thus the biomechanical function of a muscle. By quantifying muscle properties in extant primates, and exploring how they support distinct movements and postures, we can test to what extent variation is driven by phylogenetics or differences in locomotion. We collected a phylogenetically diverse comparative sample of extant primates (N = 29) to support accurate soft tissue reconstructions in extinct hominins. We compared the hindlimb muscle architecture of 8 primate species, using data obtained during detailed dissections of: *Gorilla gorilla, Pongo abelii, Pan troglodytes, Hylobates lar, Symphalangus syndactylus and Macaca mulatta, Pan paniscus and Homo sapiens*. Specimens were opportunistically collected from European zoos post-mortem, with no animals sacrificed. The Animal Ethics Committee of KU Leuven was notified, all work complying with EU regulations (approval codes M005/2023,

M006/2023). For each specimen, the right leg and pelvis were dissected, providing topographical atlases of muscle paths. Pennation angle, FL, muscle belly, tendon mass and lengths were measured, calculating PCSA and maximal isometric force (Fmax) for each muscle. A biomechanical approach of comparing muscle function plotting normalised FL versus PCSA (known as a functional space plot) was the main comparative method. Phylogenetic relatedness largely explains results in the case of genus Pan, Pongo, and Gorilla, but not in hylobatids. But similar functional patterns are also found independent of phylogenetic relationship, identifying locomotion as a potentially more relevant predictor when reconstructing musculature. This study provides support for the quantification and application of extant primate musculature in biomechanical models, offering novel insights into how the primate hindlimb is phylogenetically constrained. Additionally, providing a broader comparative dataset for predicting hindlimb musculature and locomotor capabilities in extinct hominins.

How to conserve as much Primate diversity as possible: Lessons from translocation and exsitu work

Ray Heaton[1,2,3]

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Primate populations are in decline worldwide; many species are entering more and more serious IUCN endangered categories, and sub populations and subspecies are being lost. In an ideal situation all species and subspecies would be protected and conserved within their subpopulations in range areas of appropriate habitat. Where species and subspecies ranges overlap or abut, these areas would be protected, in order to allow future evolutionary processes. Such a utopia seems unlikely under present day anthropogenic threats including human population growth and climate change. This presentation will include examples from extant Primate species populations, both translocated to wild and those kept in exsitu conditions. By considering the current situation, particularly in exsitu work with orangutans, direction for future management and intervention will be explored. In the 1970s around 60% of zoo bred orangs were hybrids between the Bornean orang (Pongo pygmaeus) and the Sumatran orang (*Pongo abelii*). As soon as molecular testing became available, these two geographically separate species were no longer bred together. In Borneo today, three sub-species of orang have been established, and a second species identified in Sumatra. In Borneo there is a risk that the three sub-species may become mixed during rescue and subsequent translocation after wildfires. This work involves hundreds of animals taken initially into captivity and then released into safe habitat. The mixing of subspecies would lead to a loss of important natural diversity. In exsitu Primate populations where several subspecies are present, the management for breeding animals should be between the same subspecies. In the Bornean orang exsitu population the three sub-species are present and the breeding management should be between subspecies, in order meet IUCN criteria, should these animals be used in reintroduction work.

Evidence for bark feeding as a cultural behaviour in wild chimpanzees (*Pan troglodytes schweinfurthii*)

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Mammals are thought to consume bark as a fallback food, to access essential nutrients or as a form of self-medication. While well-documented in wild chimpanzees, no study has systematically explored intercommunity variation in bark feeding behaviours in this species. We investigated whether bark feeding could be a cultural behaviour across two neighbouring communities (Sonso and Waibira) of eastern chimpanzees (*Pan troglodytes schweinfurthii*), that share gene flow, in the Budongo Forest Reserve of Western Uganda. Using long-term data and forest composition transects, we report that variation in bark feeding between communities is not fully explained by ecological differences. The Waibira community bark fed more frequently than Sonso, but only in Sonso did tree species abundance predict feeding frequency. Most bark fed tree species were available in both communities, but community preferences existed. We provide the first evidence that bark feeding in chimpanzees may represent a cultural behaviour which is important to inform future community-specific protection of habitats.

Live and let die: Unravelling the variation in primate lifespans

Helen Mylne[1], Lauren Brent, Kenny Chiou, Noah Snyder-Mackler, Macaela Skelton & Sam Ellis

[1] *University of Exeter*

Recently, a great deal of interdisciplinary research has focussed on increasing human healthspan. However, to do so requires that we first understand the evolutionary causes and limits of human lifespan, for which we must place humans in the context of our closest relatives: primates. Reported non-human primate lifespans range from five to over 40 years, whereas human life expectancy can exceed 80 years. However, understanding human evolutionary context is hindered by a lack of reliable estimates of wild lifespan for most primates. Ideally, calculating and comparing primate lifespans requires building lifetables from large amounts of long-term age data spanning many generations. This is temporally and financially extremely expensive to collect, and it will likely be decades before these data are available for most species. However, there exists much already-published age-structured data that could be used to make high-quality lifespan estimates. I am developing a Bayesian model to estimate the life-history parameters of all primate species from published age data, accounting for sampling bias, population growth, age estimation errors, and the presence of individuals of unknown sex. In this presentation I will provide an outline of the model we are using to estimate lifespan and display its application to a pilot dataset. The pilot results, considering reasonably well-documented species, are consistent with reported lifespan even with low data quality, and highlight some surprising differences in the survival of wild versus captive populations. Subsequently, we will use the outputs to identify average lifespan for poorly-studied species; compare males versus female lifespan; produce comparative models to identify the evolutionary causes of primate lifespan; and consider the evolutionary basis of human lifespan in the context of our closest relatives.

The Nose Knows: Assessing Welfare in Great Ape Introductions with Thermal Imaging

Marianne Paisley[1], Perrine Theroude, Eric Willaume, Morane Barthere & Gillian Forrester

[1] University of Sussex

Social introductions and transfers are some of the most challenging events in great ape management, with major implications for individual welfare and long-term social success. Welfare assessment during these transitions is often limited to behavioural observation, which may overlook subtle physiological signs of stress and recovery. This research explores the potential of thermal infrared imaging (IRT) as a non-invasive tool to measure stress responses in great apes. IRT detects changes in surface temperature, which reflect shifts in blood flow, with nasal cooling emerging as a reliable marker of acute stress in both humans and chimpanzees. This approach enables carers and researchers to monitor the physiological side of stress without physical contact or invasive sampling. Buedi, a juvenile male chimpanzee, was transferred to Parc de la Lékédi, Gabon earlier this year. His arrival at the park and integration into a new social group was tracked using combined behavioural observations and thermal imaging during his first weeks post-arrival. Additional case material from the same fieldwork will also be presented, including the introduction of a gorilla and the consequences of a failed introduction on the mental health of another chimpanzee. Although analysis is ongoing, these case studies illustrate how IRT can complement behavioural measures to provide a more complete picture of welfare during critical transitions, offering a valuable addition to the toolkit of both caregivers and researchers.

Rapid facial mimicry during social play in infant chimpanzees

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Accurately perceiving and interpreting facial expressions is fundamental to successful social engagement. Rapidly mimicking observed facial expressions i.e., rapid facial mimicry (≤ one second, RFM) is thought to facilitate such understanding, in turn enhancing the predictability of social interactions and promoting social bonding. RFM has been documented in human smiles from early ages, as well as in homologous expressions among nonhuman primates, particularly the open-mouth face (OMF) displayed during play. These parallels suggest deep evolutionary roots for this affiliative mechanism. Importantly, however, little remains known about the occurrence of OMF rapid mimicry early in primate development, leaving a gap in understanding its function across the lifespan and its broader evolutionary significance. This study examined whether infant chimpanzees (*Pan troglodytes*) aged 0–5 years (N = 33) exhibited RFM of OMFs during naturalistic dyadic play at the Chimfunshi Wildlife Orphanage. Results showed that infants were significantly more likely to produce an OMF within one second of a playmate's OMF than of a neutral expression, providing the first evidence of RFM in infant chimpanzees. Network analyses further revealed that interactions involving RFM were characterised by fewer but more intense actions, namely hitting and fast grappling, commonly observed during play fighting. These findings support the idea that, as in humans, rapid facial mimicry

in chimpanzees may reduce interactional ambiguity and foster more synchronised, coordinated play already from early developmental stages.

Tracking Gorillas, Tracking Parasites: How Climate and Ranging Location Shape Infection Risk in Bwindi mountain gorillas (*Gorilla beringei beringei*)

Louisa Watson[1], Gloria Aduku[2], Gladys Kalema-Zikusoka[2] & Giuseppe Donati[1]

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[2] Conservation Through Public Health

Environmental variation can strongly influence wildlife behaviour and health; this is an emerging topic amid the global climate crisis. Whilst many studies have been conducted on a variety of species, fine-scale studies aren't as common for species such as the great apes. This study investigates the impact of microclimate conditions, habitat structure, and parasite dynamics on mountain gorillas (*Gorilla beringei beringei*) in Buhoma and Ruhija sectors of Bwindi Impenetrable National Park, Uganda. By examining differences across elevation gradients and monthly seasonal variation, the study aimed to understand how environmental heterogeneity shapes gorilla ranging patterns and exposure to parasites. The findings highlight the importance of sector-specific microclimates and habitat structure in influencing gorilla health and behaviour. Conservation strategies that protect elevational gradients and structurally diverse forests are needed to help maintain behavioural flexibility and physiological resilience, whilst ongoing health monitoring will support early detection of parasite-related risks. This research, therefore, provides preliminary evidence and fine-scale ecological insight, offering actionable guidance for effective mountain gorilla conservation under a changing climate.

Facial expressivity moderates injury rate in macaques

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Although essential for the survival of many primates, social living is risky. Competition, conflict and injury are inevitable when interacting with others yet have implications on lifetime survival. Consequently, a range of social behaviours have evolved to mitigate these costs. Facial communication has been theorised to have both proximate and ultimate social function: to allow individuals to navigate daily interactions in coordinated ways without an escalation into conflict, and, when these successful interactions are repeated over time, to allow stable social bonds with others to form. Assessing the long-term benefits of facial behaviour is hard, however, and relies on difficult-to-access longitudinal data. Here, we quantified the facial movements of 36 individuals across nine social groups of captive rhesus macaques (*Macaca mulatta*) using the facial action coding system. These data were analysed in relation to lifetime injury data and the maintenance of strong social bonds. Quantity of expressions increased both an individual's social bond strength with others, and their likelihood of injury. However, this increased injury risk was mitigated if individuals also demonstrated a high diversity of facial behaviour. Thus, having both a higher quantity and diversity (i.e. a wider behavioural skillset) of expressions appeared to maximise the benefits of social living. This

study provides valuable evidence to support theories on the adaptive benefits of facial expression, suggesting that facial expression use reduces the likelihood of costly injury, which can significantly impact an individual's ability to survive.

15-minute talks

Fruit preference in the Red-fronted brown lemur *Eulemur rufifrons* in Kirindy Dry Forest, Madagascar

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The fleshy fruit pulp can attract many endozoochores, including primates, due to their well-developed sensory capacity and by offering them nutritional rewards. In Madagascar, an island of high endemism at major risk of biological extinction, seed dispersal by lemurs allows the colonization of new habitats by offering plants a chance to escape seed mortality, reducing competition between seedlings and mother plants, and increasing plant populations in often degraded ecosystems. However, few studies have focused on plant-primate interaction from the perspective of the attraction between southern red-fronted lemurs and the fruits of many plant species in the western dry forests. Based on what biochemical characteristics of the fruits does *E. rufifrons* present in the Kirindy forest select these food preferences? In the field, the pulp of ripe fruits of 16 plant species was collected, crushed and dried in the sun before being transported later in the laboratory to analysis. Total sugars were obtained using the Phenol-H2SO4 method after extracting with 80% ethanol. Total nitrogen was determined using the Kjeldahl procedure. Total lipids were extracted in a Soxhlet apparatus. Total energy contents of pulp were determined using by calculation. The five consumed species analysed show an average energy value of 281.1 kcal/100g including 61.1g of sugars, 1.2g of lipids and 6.3g of protein on average. Regarding the other five not consumed by the lemur, the average energy value is 162.7 kcal/100g including 27.8g of sugars, 3.7g of lipids and 4.5g of protein on average in the rainy season. In the dry season, this energy for fruits consumed is 343.8 kcal. Our study assessed the nutritional values of fruits belonging to species whose seed dispersal is closely linked to *Eulemur rufifrons* to support and improve future choices in active restoration actions in cleared landscapes where there is little heterogeneity; highlighting its importance in the conservation of this unique ecosystem.

Anthropogenic disturbance is associated with greater dietary diversity and differentiation of the gut microbial community in the Zanzibar red colobus monkey (*Piliocolobus kirkii*)

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Habitat loss is the primary threat to primates today, with many populations being encroached upon by human settlements and agriculture. Despite this, some generalist species can exploit novel anthropogenic opportunities to supplement their diet via crop foraging when preferred foods are scarce. This can potentially come with significant health risks however, including zoonoses and changes in the composition of the gut microbiome potentially increasing individuals' susceptibility to pathogens. The Zanzibar red colobus monkey (*Piliocolobus kirkii*) is unusual in that congeners are highly sensitive to anthropogenic disturbance, yet in some cases populations of *P. kirkii* can survive in highly disturbed habitats. We studied eight groups of Zanzibar red colobus living in the forests (n=3 groups) and farmlands (n=4 groups) of Jozani Chwaka Bay National Park and the urban village of Paje (1 group), to examine the effect of habitat disturbance on dietary composition and their gut microbiome. These were characterised by DNA metabarcoding, using 16S and ITS2 primers to sequence plant and bacterial DNA sequences found in faecal samples (n=137). We predicted that dietary diversity would be lowest in the urbanised village due to deforestation and highest in the farmland due to a greater variety of crops to supplement their diet in the absence of their preferred forest food species. We also predicted that the diversity and composition of the gut microbiome would vary across habitats in association with dietary composition. We found that farmland individuals had significantly higher dietary diversity than either forest or village individuals and that forest monkeys had a significantly less diverse gut microbiome than those in the urbanised village. Both dietary and microbiome composition showed significant variation between habitats. This demonstrates that although *P. kirkii* is capable of exploiting anthropogenic resources and landscapes, this may come at the cost of a disrupted gut microbiome.

Navigating agricultural landscapes: Crop-foraging behaviour and risk mitigation in the Zanzibar red colobus (*Piliocolobus kirkii*)

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In an increasingly human-altered landscape, wildlife must navigate environments that present both new opportunities and risks. Many generalist species survive by adjusting their behaviour, however, little is known about how ecological specialists may use behavioural flexibility to cope with these risks to persist alongside humans. Understanding how animals perceive and respond to such risks is crucial, as their behavioural adjustments may shape their ability to coexist with humans and survive environmental change. To examine one such case where novel ecological opportunities (crops) are paired with risks (human crop-guarding), we studied two groups of Zanzibar red colobus (*Piliocolobus kirkii*) living in a heavily modified farmland-fallow landscape at the edge of Jozani-Chwaka Bay National Park, Zanzibar. We observed colobus foraging on crops and the amount of human traffic in their vicinity to assess if the colobus perceived a risk from and responded to human presence. Despite high rates of human defence, the colobus foraged on crops almost daily and exhibited higher feeding rates when feeding on crops than on other foods. When human traffic was higher, foraging bouts were shorter but more frequent, suggesting a risk-sensitive approach that maximises food intake while minimising exposure to humans. Group cohesion and vigilance rates were higher in crop fields compared to non-crop areas, consistent with responses observed in other species inhabiting a "landscape of fear". Rates of rough self-scratching (a putative stress-related behaviour), however,

were lower during crop-foraging, perhaps reflecting the need to forage faster or the safety that comes with the observed increased group cohesion. These findings reveal that P. kirkii, despite its dietary specialisation, demonstrates considerable behavioural flexibility in human-altered habitats. Understanding these flexible responses is therefore key to predicting how highly specialised primates can cope with environmental change and to inform strategies that mitigate human-primate conflict.

From forests to resorts: How tourism development shapes the foraging ecology of the Zanzibar red colobus

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Habitat fragmentation, land-use change and human encroachment, exacerbated by the rapid expansion of tourism, are placing increasing pressure on biodiversity, particularly within island ecosystems such as the Zanzibar Archipelago, where endemic species face constrained ranges and limited resources. For primates, anthropogenic change extends beyond mere habitat reduction, altering key aspects of their ecology, including foraging patterns, social interactions, and exposure to predators. The Zanzibar red colobus (*Piliocolobus kirkii*), an endangered primate endemic to Unguja Island of the Zanzibar Archipelago, is increasingly exposed to anthropogenically altered landscapes, potentially affecting its foraging ecology and survival. To investigate how accelerated tourism development outside protected areas is affecting this primate, we studied two groups of colobus in the coastal villages of Paje (N = 12 observation days) and Jambiani (N = 12 days), Unguja Island. During group follows, we recorded spatial and temporal data on feeding patch utilisation as well as noted any interactions between the colobus and people or village dogs. The colobus groups we studied ranged predominantly within the grounds of hotels and showed a combined feeding time of 90.9% in hotel grounds compared to 9.1% in villages, spending most of their time feeding on a variety of native and exotic plants. While, for the most part, their foraging behaviour did not place them in direct conflict with hotel staff, there were occasions when they caused damage to designed gardens. The Zanzibar red colobus displays behavioural flexibility, using hotel grounds to feed on both native and exotic plants, highlighting the critical role of hotel vegetation as a food source. Conservation strategies should integrate both natural and anthropogenic habitats to balance primate protection with sustainable tourism and development.

Chimpanzee predation risk influences the distribution and sleeping site selection of a nocturnal primate, *Galago senegalensis*

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Spatial variation in predation risk creates a 'landscape of fear' in which prey adjust their behaviour accordingly. We investigated the spatial abundance of two galago populations subject to differing predation pressures, and the sleeping site selection of the population facing greater predation risk. At Fongoli, Senegal, Western chimpanzees (*Pan troglodytes verus*) hunt Northern lesser galagos at their

sleeping sites, whereas at Lolldaiga Conservancy, Kenya, galagos are not subject to chimpanzee predation. We recorded galago locations and used density surface modelling to estimate their distribution and abundance, identifying the best predictors of spatial abundance at both sites. At Fongoli, we also compared vegetation and habitat data from galago sleeping sites to control sites, to determine the best predictors of sleeping site selection. Chimpanzee presence influenced galago spatial distribution at Fongoli: estimated galago abundance was higher in areas with fewer chimpanzee sleeping locations and lower overall NDVI scores (0.22–0.43). In contrast, at Lolldaiga, elevation was the sole predictor of galago abundance, with individuals predominantly found at lower elevations (1700–1950 m). Unlike their active distribution, galago sleeping site location at Fongoli was not associated with chimpanzee presence. Instead, galagos maximised concealment by consistently sleeping in tree cavities and selecting large trees with multiple cavities, possibly to evade predators. Our findings reveal how predation pressure can shape both spatial distribution and microhabitat selection in primate communities, and enhance our understanding of how animals navigate landscapes of fear.

Same-sex sexual behaviour (SSB) facilitates affiliation and rank in rhesus macaques (*Macaca mulatta*)

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Social behaviours are pivotal in social species, managing dominance hierarchies, reinforcing bonds, and facilitating access to mates. Despite previously being framed as evolutionarily costly, same-sex sexual behaviour (SSB) might be one such behaviour, with the potential to contribute social benefits. In the current study, we tested three hypotheses, i) socially complex animals exhibit a repertoire of social behaviours; ii) SSB is socially distinct from other mounting behaviours; and iii) SSB facilitates benefits to social structure. Our analyses demonstrate that social behaviours increased with total mounts, yet SSB remained socially distinct from other mounting behaviours. More specifically, SSB improved affiliation within male mounting pairs and increased individual centrality within the social network. Furthermore, we show that SSB was associated with social benefits not reflected in different-sex sexual behaviour (DSB) and total mounting. Specifically, SSB is linked with stabilising rank over time, increasing access to higher-ranking males when forming coalitions, and broadening the diversity of male affiliative connections. Together, these findings indicate SSB contributes beneficially to rank-related and affiliative dynamics through socially specific mechanisms, not solely by-products of sexual activity. We suggest these social benefits provide a plausible advantage as to why SSB is maintained in socially complex populations.

First documentation and quantification of wild chimpanzee rock climbing: a comparison to tree climbing and insights to chimpanzee behavioural plasticity

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Rock climbing has been proposed, alongside tree climbing, as a selective factor contributing to the retention of climbing adaptations in hominins inhabiting rugged, open environments. Yet, biomechanical analyses of climbing in apes across varied substrates remain limited, constraining our understanding of how morphologies adapted to tree climbing might also facilitate rock climbing. This study presents novel biomechanical data on wild chimpanzee rock climbing, comparing spatio-temporal gait characteristics with those of tree climbing. We tested the predictions that, due to the irregularity of rocky substrates, (1) limb–substrate contact duration—quantified by four-limb contact Cycle Duration (CD; time to complete a full movement cycle) and relative Stance Phase (rSP; proportion of CD a limb is in contact with the substrate)—would be longer, and (2) more extreme stretched/retracted limb positions would be employed during rock climbing. Rock climbing data were collected between 2023-2025 using camera traps at two rugged, open habitat chimpanzee sites: Issa Valley, Tanzania (*Pan troglodytes schweinfurthii*), and Moyen Bafing, Guinea (*P. t. verus*). Tree climbing bouts were recorded during follows of habituated chimpanzees at Issa (2020, 2023). We analysed over 20 vertical ascent bouts per substrate, extracting limb contact durations and positions from touch-down and lift-off events. We found that CD was significantly longer during rock climbing, whereas rSP was lower. Rock climbing involved more extreme stretched and retracted positions in the hindlimb but not the forelimb, where reaching movements were comparable to tree climbing. These preliminary findings suggest that chimpanzees employ more dynamic transitions between stable postures on rock surfaces, likely reflecting the need to maintain the centre of mass close to the surface on constrained, uneven routes. Such results enhance our understanding of climbing biomechanics in large-bodied apes, highlighting the behavioural plasticity required to navigate complex terrain, including hindlimb extension consistent with the bipedal Bauplan.

Social ebb and flow in captive chimpanzees – a case study of the impact of naturalistic social interventions on behaviour and social dynamics

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In free-living populations, the fission-fusion nature of chimpanzee society makes changes in the social environment a relatively common experience for individuals. These social changes may compromise existing social organisation, particularly when change is frequent or when high-ranking individuals are involved. Individual emigration and party reunion following periods of separation are commonplace in free-living chimpanzee populations and the management of captive chimpanzee populations often requires the separation or removal of individuals from groups, mirroring the natural processes of fission-fusion social organisation. However, the impact of such interventions in captive populations is understudied. Our study sought to examine the effect of two such interventions (the merging of groups following a period of separation and the removal of an adult female from an existing group) on the behaviour of a group of captive chimpanzees at the Johannesburg Zoo. In both circumstances, the

chimpanzees increased positive social behaviour and reduced or maintained levels of aggressive behaviour. Both interventions resulted in changes to inter-individual associations of the chimpanzees but the removal of the adult female appears to have been less stressful than the merging of two groups. These experiments provide a pair of case studies to illustrate how such social change influences chimpanzee social dynamics in captivity and provide insights into the mechanisms employed by individuals to manage the impacts of social instability.

Addressing the Cruelty of Macaques in Social Media Content

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The Asia for Animals (AfA) Social Media Animal Cruelty Coalition (SMACC) monitors the widespread appearance of macaques in social media content across platforms such as Facebook, Instagram, TikTok, Twitter, and YouTube. Our observations highlight serious welfare concerns, with material ranging from seemingly harmless clips to extreme and disturbing abuse. In a review of 1,200 videos, volunteers repeatedly encountered new content, showing how persistent and widespread the problem remains. Macaques are often separated from their mothers at a young age, leading to maternal deprivation, isolation, and environments that fail to meet their complex needs. They are exploited for online attention, dressed in clothing, forced into staged behaviours, or subjected to dangerous stunts and, in some cases, sexual abuse. Beyond the immediate suffering, such content normalizes cruelty, misleads audiences into perceiving macaque exploitation as acceptable, and fuels both legal and illegal primate trade, with consequences for conservation. This report calls for stronger social media policies addressing animal cruelty and provides recommendations for how the public can play a role in supporting change. By raising awareness, it aims to encourage collaborative efforts between researchers, advocates, and policymakers to reduce exploitation, improve welfare, and protect wild populations.

Dominant baboons experience more interrupted and less rest at night

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Sleep is a fundamental biological process. The amount and quality of sleep individuals get can impact various aspects of human and non-human animal health, ultimately affecting fitness. For wild animals that sleep in groups, individuals may disturb one another's sleep, but this aspect of social sleep has been understudied due to methodological challenges. Here, using nighttime rest (absence of bodily movements) as a proxy for sleep, we test the hypothesis that individual's social dominance affects nighttime rest in a troop of wild, highly hierarchical chacma baboons (*Papio ursinus*). First, we show

that the troop's night-time rest (determined by 40Hz acceleration data) is highly synchronised. Next, we link night-time rest dynamics to daytime spatial networks and dominance hierarchy (from 1Hz GPS data and direct observations). We show that baboon nighttime states (activity and rest) are more synchronised between similarly ranked individuals, and unexpectedly, more dominant baboons experience more interrupted and less nighttime rest than lower-ranked baboons. We propose that this hierarchy effect is explained by higher-ranked baboons resting closer to more group members, which leads them to exert greater influence on each other's night-time behaviour compared to lower-ranked individuals. Our study provides the first evidence for the impact of social hierarchies on aspects of sleep in a wild primate, suggesting that dominance status may impose trade-offs between social rank and the quality and quantity of sleep.

Quantitative Color Measurements Suggest Functionality of Primate Natal Coats

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Infants in many primate species are born with conspicuous natal coats that can differ greatly from adult pelage, yet the evolutionary function of this trait remains unresolved–in part because past studies have relied largely on categorical subjective descriptions rather than quantitative measures of color. Several adaptive hypotheses have been proposed—including anti-infanticide aposematism, paternity cloaking, maternal care solicitation, and allomaternal care solicitation. Using an image database of 209 species, we quantified infant–mother coat contrast by extracting color values from matched body regions and calculating LAB Euclidean distances. We then used Bayesian phylogenetic generalized least squares (PGLS) analyses to test competing hypotheses for the evolution of conspicuous natal coats. We found evidence in favor of the anti-infanticide aposematism, maternal solicitation, and allomaternal solicitation hypotheses but not the paternity cloaking hypothesis. Specifically, species with documented infanticide were predicted to have greater infant-mother color contrast, as were those species with greater infant-to-mother body weight ratios (an indicator of increased maternal care need) and with allomaternal care. These findings suggest that conspicuous natal coats may have evolved as an anti-infanticide deterrant strategy and may stimulate increased caregiving and investment from females. By integrating quantitative color metrics, broad comparative data, and Bayesian phylogenetic methods, this study provides the most comprehensive test to date of hypotheses on the evolution of primate natal coats. Our future work will investigate the ontogeny of color change across species and additional evolutionary hypotheses.

The power of position: How dominant baboons (*Papio ursinus*) shape group behaviour through spatial network structure

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In animal groups with social hierarchies, dominant individuals often have a stronger influence on collective behaviour. However, the mechanisms by which such influence arises remain unclear. In this talk I will show how dominant chacma baboons -- that are more centrally positioned within the group's spatial network -- have larger "zones of influence" (defined using unsupervised clustering of inter-individual proximity from high resolution GPS data) and elicit stronger follower responses during movement events. This work highlights how individual traits shape group-level outcomes via spatial organisation, rather than coercion or direct control, offering broader insights into self-organisation and leadership in collective animal behaviour.

Quantifying the kinematic consequences of captivity: Movement analysis of zoo versus wild gorillas during terrestrial walking

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Studying the locomotor biomechanics of great apes offers insight into the evolution and functional diversity of ape locomotion and can help inform locomotor reconstructions of extinct apes, including hominins. However, much of what is known about ape biomechanics derives from zoo-housed populations and it remains unclear whether these conditions accurately reflect natural locomotor patterns. To address this, we compared terrestrial knuckle-walking kinematics in wild and zoo-housed western lowland gorillas (*Gorilla gorilla gorilla*) using video data collected in Loango National Park, Gabon and at the Leipzig Zoo, Germany. Across 120 walking strides, spatiotemporal parameters were determined by identifying gait events, and joint angles calculated from the positions of anatomical joint centres. Additive linear regression models tested the effects of environment and age–sex category on kinematic variables. Of the five gait parameters measured, only duty factor differed significantly between wild and zoo-housed gorillas, while all five varied between age–sex groups. Likewise, joint angle variation was best explained by intrinsic morphological differences related to age and sex. Silverbacks showed the lowest hindlimb and forelimb retraction angles, adolescents the highest, and blackback and adult female individuals fell between these extremes, indicating that sex and ontogenetic stage strongly shape stride kinematics and limb use. Despite the marked differences between zoo and wild environments in habitat structure, activity budget and diet, distinction in terrestrial walking kinematics was minimal, suggesting that zoos do not substantially constrain the musculoskeletal expression of this locomotor behaviour. These results provide a basis for interpreting data from zoo-housed apes compared to those in the wild. However, extending such analyses to arboreal locomotion, where mechanical demands and environmental complexity are greater, will be essential for assessing how context influences ape biomechanics. This will help to refine methods for using data from zoo-housed populations as proxies in evolutionary reconstructions.

Re-evaluating the Social Complexity Hypothesis for Acoustic Communication in Primates: The Relationship Between Social Factors and Vocal Complexity

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The complexity of primate vocal communication is thought to be driven by phylogenetic, ecological, and social factors. While the link between repertoire and group size is the most studied aspect of the social complexity hypothesis applied to communication complexity, the influence of other social components, such as social organization and mating systems, remains underexplored. In this study, we tested whether group size, mating system, and social organization are correlated with four measures of vocal complexity: repertoire size, number of notes, number of calls with multiple notes, and number of alarm calls. To achieve this, we conducted a systematic review of vocal repertoire descriptions across all primate suborders and performed a generalized linear model analysis using data from 43 species across 14 primate families. Our results reveal a complex relationship between social and vocal complexity. Contrary to our predictions and previous studies, neither group size nor mating system was significantly correlated with any of the acoustic variables analysed. In contrast, we found that solitary species have a smaller vocal repertoire and fewer alarm calls compared to species with multi-male-multi-female groups. These findings, allied with the distinct results of previous work, suggest that the connection between vocal and social complexity is itself complex. Although social factors appear to be significant drivers of vocal evolution, other factors such as predation risk are also involved in this process. Future studies that incorporate ecological factors and other potential pressures in more detail will be crucial for a more complete understanding of the individual and combined effects shaping vocal evolution.

Training, Conducting, and Validating a Novel Active Choice Judgement Bias Task in Three Species Zoo-housed Apes

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Cognitive bias tasks test how affective states influence information processing. Within the last two decades, cognitive bias tasks have become prominent in animal welfare science due to their ability to integrate multiple components of wellbeing and provide a summative assessment of valanced welfare states. However, due to the time needed for animal training, cognitive bias tasks have historically been underrepresented in zoo animal welfare research. I aimed to develop an active choice judgement bias task in zoo-housed apes using low-cost, accessible materials. I trained 29 apes of three species on the task, however only seven bonobos and two chimps successfully passed criteria. Outcomes of the judgement bias task in bonobos were analyzed in relation to four quantitative behavioral welfare indicators and one qualitative welfare indicator. A sixth variable, group size, was included due to the unique fission-fusion husbandry style for bonobos at the zoo. We found that bonobos increased pessimistic choices as the number of experiments they participated in increased. Furthermore, bonobos displayed more pessimistic choices on days when they spent more time performing

abnormal behaviors such as regurgitation and reingestion, suggesting that negative states were detected by the task. Conversely, bonobos displayed more optimistic choices on days when they spent more time playing and on days when their social group was larger, suggesting that positive states were also detected. Results are interpreted in light of both the applied and theoretical literature surrounding welfare predictors and cognitive bias tasks. Recommendations are made for future researchers intending to conduct active choice judgement bias tasks in zoo-housed primates.

Virtual environment tasks with non-human primates

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Virtual environment (VE) software is being increasingly employed as a non-invasive method in primate cognition research. Despite the increased complexity of visual input compared to more traditional computerised studies, several groups of primates have been trained to navigate virtual three-dimensional environments on touchscreens. We previously found that zoo-housed chimpanzees are able to use virtual landmarks somewhat flexibly as beacons to locate food and are able to turn efficiently to out of sight food, possibly displaying object-permanence. Here, we extend our research to capuchin monkeys to investigate memory in a virtual delayed-response task. On a touchscreen, subjects viewed three hedge rectangles from a hilltop, one containing food rewards. While walking down the hill, the hedges obscured the food, requiring monkeys to remember its location for varying delays. We looked at ten capuchins' short-term memory performance in the VE task. We found the predicted effect of delay in the VE task, and comparable performance to an equivalent physical task. Additionally, monkeys spontaneously abandoned some trials, most often in long-delay trials. In study two, we explore this further using an opting-out paradigm to disentangle metacognitive judgements from learned associative rules. Monkeys receive two options: attempt a memory task for a high-value reward or "opt-out" by moving to a low-value reward. We orthogonally vary delay, number of hedges, and contextual cues to create unique trials. We predict that, if monkeys make metacognitive judgements, their opting-out rates will increase with task difficulty. The comparable performance of monkeys in virtual and real environments presents VEs as an exciting new tool for comparative memory research. In VEs, both familiar and novel stimuli can be presented in innovative ways, opening the door to studying aspects of cognition in zoos which previously may not have been feasible.

Conserving the watchful sleeper: density, distribution, sleeping site ecology of *Lepilemur cf. ahmansoni* in Namoroka National Park, western Madagascar

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Madagascar's dry forests are increasingly threatened by human-induced fires and habitat fragmentation, placing strong pressure on wildlife that depends on these ecosystems. Understanding

how species respond to such disturbances is critical for developing effective conservation and fire management strategies. *Lepilemur cf. ahmansoni* has never been studied in the wild, and information on its ecology remains scarce. This study aimed to assess the species' sleeping site preferences, distribution, and density across Namoroka National Park and its bordering habitats. Lemur surveys were conducted using line-transect distance sampling in five sites, focusing on sportive lemur sleeping sites. The Point-Quarter method was used to characterize habitat, specifically tree density and vertical forest structure. *Lepilemur cf. ahmansoni* occurred at a remarkably high density (mean ± SD: 612.6 ± 597.2 individuals/km2), likely reflecting habitat compression caused by frequent wildfires that restrict individuals to limited forest patches. The species showed a preference for sleeping trees with DBH > 10 cm in dense forest, although it persists in disturbed areas. These findings suggest that, while *L. cf. ahmansoni* exhibits some tolerance to habitat disturbance, its reliance on dense forest makes it vulnerable to ongoing degradation. As diurnal, charismatic species often dominate conservation priorities, these results emphasize the urgent need to integrate lesser-known nocturnal species into fire management and habitat conservation strategies in Madagascar.

The effect of anthropogenic habitat disturbance on gastrointestinal nematode infections in the Zanzibar red colobus: Microscopic and molecular analyses show method-dependent parasite patterns

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Monitoring gastrointestinal parasite infection patterns in primates is useful for assessing how anthropogenic disturbance may influence individual health and survivorship, and population persistence. We studied a forest specialist primate, the Zanzibar red colobus (*Piliocolobus kirkii*), that sometimes persists in anthropogenically altered landscapes. We profiled gastrointestinal nematodes across a habitat disturbance gradient using both microscopic and molecular identification. For microscopy we analysed 135 samples from 8 groups across forest, agro-forest matrix, and village habitats (July-September 2024). We applied molecular techniques to 139 samples collected from 8 study groups (7 groups match microscopic sampling) but over a longer period (July 2023 - April 2025). We used 18S rRNA metabarcoding, assigning taxa to genus level where possible. Microscopy identified a broader set of nematode genera when compared to metabarcoding techniques, with *Strongyloides* and *Trichuris* among the most frequently observed. Metabarcoding similarly highlighted *Strongyloides* as widespread, with an unidentified strongyle-type lineage among the most frequent nematodes. When restricted to individual monkeys within a shared sampling window (microscopy N = 54, molecular N = 66 individuals), any-nematode prevalence was higher by metabarcoding than by microscopy. Across habitats, microscopy did not show a clear difference in mean nematode richness, whereas molecular data suggested higher richness in less disturbed habitat (forest). Patterns of co-infection (≥2 genera per sample) diverged between methods, with microscopic data showing an increase of co-infection with disturbance, while molecular data showed significantly higher levels of co-infection in forest than village monkeys. Together, these results can highlight that microscopy and

metabarcoding methods capture complementary facets of infection yet can yield different habitat gradients, likely due to egg shedding windows, difficulties with visual identification and molecular primer bias. Deploying nematode-specific primers should increase sensitivity and genus level resolution, reduce discrepancies between methods, and clarify true habitat effects in studies of primate parasite ecology.