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ABSTRACT # 53

THE RELATIONSHIP BETWEEN PERSONALITY, SEASON, AND WOUNDING IN ZOO-HOUSED JAPANESE MACAQUES (*MACACA FUSCATA*): A MULTI-INSTITUTIONAL STUDY

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Understanding the factors that affect wounding can be an important tool to enhance the care and management of captive animal populations. Previous studies reported that season (breeding/nonbreeding) and sex predict rates of wounding in zoo-housed Japanese macaques, but the degree to which individual differences expressed in personality ratings may also explain some inter-individual variance is yet to be explored. Here, we collected wounding data over a 24-month period for 48 Japanese macaques living at eight AZA-accredited zoos. The macaques were also rated by keepers on a 26-item personality questionnaire. Principle components analysis revealed four personality components: Openness, Friendliness, Dominance, and Anxiety/Reactivity. Mixed-effects logistic regression models revealed an interaction between season and the component Friendliness. Individuals rated higher on Friendliness incurred fewer wounds in the non-breeding season, but not in the breeding season ($Z = -1.97$, $SE = 0.15$, $p = .049$). Thus, as has been recently shown in rhesus macaques, personality seems to mediate wounding receipt in Japanese macaques, although different personality components explained inter-individual variance in wounding. These differences likely reflect species differences in behavior and personality structure, or perhaps the influence of differing management practices, highlighting the importance of individualized approaches for captive primate care and welfare.

ABSTRACT # 54

PROJECT ZOOENTROPY: MONITORING ZOO ANIMAL BEHAVIOR THROUGH A LENS OF COMPLEXITY

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Animal behavior can be viewed as a complex adaptive system evolved to facilitate biological interactions. The field of complex systems dynamics then provides us with tools to assess features of animal behavior relevant to animal welfare, allowing us to monitor behavioral health and measure impacts of management interventions such as environmental enrichment. Here, we introduce Project Zooentropy, which aims to assess complexity in behavior sequences of zoo animals, including primates, to discover baseline properties and responses to internal and external conditions. In the talk, we show how two measures of complexity applied to behavioral time series – approximate entropy (ApEn) and detrended fluctuation analysis (DFA) – can be used as indicators of an animal's condition or the quality of its environment. After introducing the theory and illustrating how such an approach has been used previously, we present a series of case studies with primates housed at Kyoto City Zoo and the Japan Monkey Centre to explore variation in behavioral complexity according to species, demographic and environmental characteristics. We also show that complexity signatures as measured by ApEn correlate with the frequency of stereotypical head movements in brown capuchins (*Sapajus apella*) housed at Kyoto City Zoo; monkeys exhibiting increased stereotypies produced less predictable behavior sequences. We aim to provide proof-of-concept through this work and stimulate further investigation into this emerging analytical framework for primate health and welfare assessment.

ABSTRACT # 55

HOW TO SURPASS YOURSELF AT JUMPING: A LESSON FROM ZOO-LIVING BICOLOR TAMARINS AND GOELDI'S MONKEYS

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In many primate species, leaping behavior is crucial for crossing gaps in the canopy, escaping predators, and capturing prey. We investigate vertical leaping – used here as a measure of leaping potential that can be applied to horizontal leaps as well – in two platyrrhines: *Saguinus bicolor* ($n = 2$, 20 leaps) and *Callimico goeldii* ($n = 3$, 24 leaps). The latter is often classified as a vertical clinger and leaper (VCL: 23% of travel time) compared to *Saguinus* (VCL: 8% of travel time), with associated anatomical features thought to correlate with performance. These species make an ideal natural experiment investigating leaping adaptations. We trained individuals to leap to perches placed 80, 100, and 120 cm high within a custom-built tower. The mechanical output for each animal for each successful leap was calculated from

force plate measurements and 3D video recordings. Despite their smaller size, Goeldi's monkeys (370–440 g) produced push-off forces equal ($p = .46$) to tamarins (490–590 g) and achieved greater take-off velocities ($p = .003$). Surprisingly, individuals in both species reached targets higher than the maximal height implied by their take-off velocity. We hypothesize this phenomenon is possible because of specific movements of the body's segments realized during the airborne phase. These results suggest that performance is associated with anatomical and behavioral adaptations, only the former of which can be inferred from the fossil record. Supported by NSF BCS-2020515 and BCS-2020434.

ABSTRACT # 56

USING THE HEALTH & BEHAVIOR OF WILD CHIMPANZEES TO INFORM CAPTIVE CHIMPANZEE CARE: FOCUS ON FEEDING AND FORAGING

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In this paper, we discuss wild chimpanzee (*Pan troglodytes*) behavioral ecology pertaining to nutrition, health, wellbeing and overall welfare. Studies on captive chimpanzee welfare are extensive, while research on wild chimpanzee welfare is not nearly as common in current literature. An updated exploration of wild chimpanzee welfare issues and methods of assessment is of great importance to conservation projects and field researchers, as well as to managers of chimpanzee sanctuaries and other captive facilities, including zoos and laboratories. Such information can reveal whether specific or general wild welfare protocols and methods are (a) working positively or negatively towards an individual's wellbeing and (b) how wild chimpanzee health and behavioral diversity can continue to guide the welfare of captive chimpanzees.

ABSTRACT # 57

USE OF SECONDARY MATRIX BY MOUSE LEMURS IN NW MADAGASCAR

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Deforestation is widespread across Madagascar and threatens the island's biodiversity, resulting in an increasingly fragmented forest landscape composed of fragments isolated from each other by anthropogenic grasslands (i.e., matrix). This anthropogenic grassland matrix contains

matrix elements such as isolated trees, small shrubs, and drainage lines. Some lemurs may preferentially use matrix elements to facilitate dispersal between fragments. Therefore, it is important to understand to what degree lemurs use the matrix. We investigated matrix use in *Microcebus murinus* and *Microcebus ravelobensis* in a fragmented landscape in northwest Madagascar. We tested the following predictions: lemurs would use matrix less often than forest fragments and if they used the matrix, then they would prefer matrix elements compared to grassland. In 2011, we visually surveyed line transects in four areas containing matrix elements and four adjacent forest fragments during nocturnal walks. In 2017, we set up traplines in four areas of the matrix containing matrix elements, three areas that were anthropogenic grassland, and six traplines in adjacent fragments. We compared the relative abundance of mouse lemurs in matrix transects to fragmented forest transects, and the relative abundance of captured lemurs in matrix elements, anthropogenic grassland, and fragment traplines. We found that encounter rates of mouse lemurs did not significantly differ between the matrix and fragmented forest transects or traplines. Our study highlights that mouse lemurs do use matrix elements.

ABSTRACT # 58

SOCIAL STATUS PREDICTS MORTALITY AND PHYSIOLOGICAL PARAMETERS DURING AN OUTBREAK OF ACUTE RESPIRATORY DISEASE IN WILD MALE CHIMPANZEES (*PAN TROGLODYTES SCHWEINFURTHII*) AT NNGOGO, KIBALE NATIONAL PARK, UGANDA

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Although high social status often bestows health and survival benefits on group-living female primates, male status acquisition, in contrast, may impose health-related costs. Prominent hypotheses suggest that trade-offs between male social status and health are mediated, in part, by the hormones cortisol and testosterone. In the present study, we used data collected before, during, and after an outbreak of acute respiratory disease in wild chimpanzees (*Pan troglodytes schweinfurthii*) to investigate whether male social status predicted (1) survival and (2) physiological responses to disease. Although social status did not predict the presence of clinical signs, high ranking males were less likely to die during the outbreak than low ranking males. In all males, clinical signs corresponded to increased urinary levels of cortisol and neopterin (a biomarker of proinflammatory cell-mediated immune activation) and decreased testosterone levels. However, when exhibiting clinical signs, high ranking males exhibited lower neopterin levels and higher testosterone levels than did low ranking males. We did not find any associations between social status and cortisol. These findings suggest that high ranking male chimpanzees enjoy immune advantages to respiratory disease and that this effect may be linked to testosterone, supporting experimental and clinical evidence