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Abstracts

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Oral Presentations

Sharing the Mandrill's Range: Conservation Planning for an Iconic Rainforest Primate

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The mandrill (*Mandrillus sphinx*), with its brightly coloured face and rump, is one of the most recognised of all primates. The general public are mostly aware of mandrills; nearly 150 years ago, Darwin referred to the mandrill as the most spectacular of mammals and now, Disney's Lion King character Rafiki is based on a mandrill. Yet, when I began working in Gabon's rainforests in 1993, there were only 7 published research articles on the species in the wild. At that time, almost the entire species range was available for logging permits or was already being logged. The species was recorded in bushmeat markets everywhere that it occurred and we had no measurement of how this did, or might, affect the species' survival. I have since carried out nearly 25 years of research on wild mandrills. My research has allowed me to discover just how surprising this species is, to quantify the threats facing it and to work with the Gabonese government towards a sustainable future for mandrills. My presentation will discuss the unique needs of a species that has extreme sexual dimorphism, extreme group sizes, is extremely mobile and lives in a threatened habitat. I look at the steps to effective conservation planning for mandrills, ask how robust their future might currently be and explore the tipping points that may lead to a secure or an insecure future for the species.

The Evolution of Primate Self-Medication with Special Reference to Strategies of Parasite Control

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Parasites, viruses, bacteria and other pathogens cause a variety of diseases that affect the behaviour and reproductive fitness of an individual. Host-parasite co-evolution has had a great impact on the behaviour and dietary selection patterns of all species across the animal kingdom. While the study of animal self-medication as a science is relatively new, a majority of this work has been conducted on primates. To date, research has classified health maintenance and self-medicative behaviours into four modes: 1) optimal avoidance or reduction of disease transmission; 2) the dietary selection of items with a preventative or health maintenance effect; 3) ingestion of a substance for the curative treatment of a disease or the symptoms thereof; and 4) external application of a substance to the body for the treatment or control of disease bearing insects, infections or inflammation. This presentation will review our understanding of these modes in primates, and compare those strategies with examples from other species to illustrate the wide and deep evolutionary origins of self-medication in the animal kingdom as a response to parasite infection.

Community Empowerment for the Conservation of Critically Endangered Primates and their Habitat in South-Eastern Côte d'Ivoire

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In a revised edition of its Conservation Action Plan for African Primates, the IUCN/SSC Primate Specialist Group insisted on the urgency of surveys in south-eastern and south-central Côte-d'Ivoire, with the primary goal of searching for viable populations of *Ptilocolobus badius waldronae*, *Cercocebus lunulatus*, and *Cercopithecus roloway*. These three endemic and Critically Endangered primates are considered to be the most threatened primates of West Africa. Following that second recommendation, surveys conducted throughout the range of these taxa in eastern Côte d'Ivoire and Western Ghana highlighted extensive habitat loss and dwindling primate populations within this faunal zone. In Côte d'Ivoire, field surveys made from 2004 to 2008 failed to document the presence of *C. roloway* and *C. lunulatus* in most forests, with the exception of Tanoé forest, 12,000 ha (a non-protected swampy forest), where both monkeys still abound, and a few other forests where *C. lunulatus* has survived. The probable extinction of *P. b. waldronae* has been reported, but there is relatively recent evidence that this red colobus monkey has survived in Tanoé forest. Tanoé forest also supports the Critically Endangered *Colobus vellerosus* and several other threatened monkeys. For these reasons, Tanoé forest is considered as a top priority site for primate conservation in West Africa. In 2006, we initiated a community-based management programme for that forest in collaboration with the nine neighbouring communities. The main activities of this programme comprise (i) community organisation and capacity building for conducting routine conservation activities and implementing development projects, (ii) technical support for the designation process of the Tanoé-Ehy forest as a community-managed protected area and forest surveillance, (iii) biological surveys and biomonitoring with the involvement of local communities, (iv) environmental education using appropriate approaches, and (v) support to local development projects.

The Sharing of Natural Resources Between Mende People and Non-human Primates in the Tropical Forest of Gola (Sierra Leone)

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At the time when human population is rapidly growing and the natural habitat is declining at unprecedented rates, it is essential to understand how humans continue to coexist with some of the most threatened species on Earth. Forests are not only the primary habitat for several non-human primates, they also play a central role in people's lives by, for example, providing material for construction, fuel and traditional medicine. Our study aims to identify the primary wild plants used mutually by local people and two endangered primates in Gola Rainforest National Park, Sierra Leone. We conducted semi-structured interviews in 15 forest edge communities to assess people's use of wild plants. Our social results conclude that 62% of the interviewees living within 4 km of the protected National Park rely on wild plants for their daily activities. Based

on previous primate dietary studies, about 60% of the wild plants listed by people are consumed by western chimpanzees (*Pan troglodytes verus*) and 18% by red colobus (*Piliocolobus badius*). However, behavioural observations indicate a likely higher degree of co-use in wild plants for shelter and movement of red colobus. This multidisciplinary approach of social sciences coupled with dietary analysis aims to inform conservation management in Gola and contribute to a growing body of research that supports the co-existence of humans and wildlife.

Non-invasive Genetics Provide Insights into the Conservation Status of Two Colobine Monkeys in Gola Rainforest National Park, Sierra Leone

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The Upper Guinea red colobus (*Piliocolobus badius*) and the king colobus (*Colobus polykomos*) are two colobine monkeys that inhabit West Africa. Their conservation status is Endangered and Vulnerable, respectively, and they are both especially threatened by habitat loss and hunting. However, most of their natural populations inhabit forests close to human settlements that are poorly known. Gola Rainforest National Park (GNRP), in Sierra Leone, is a large continuous patch of forest that, although it has been heavily affected by the civil war that lasted until 17 years ago, has now little human interference, and has great potential to harbour long-term viable populations of both primate species. As such, this is an interesting system in the West African context, particularly in comparison to more fragmented forests, such as Cantanhez National Park in Guinea-Bissau, where these species have been genetically studied and reported to be declining, showing impoverished levels of genetic diversity. This is the first genetic study of these species in GNRP, aimed at investigating their levels of genetic diversity and population structure to ultimately infer their conservation status. We used 160 and 40 non-invasively collected faecal samples of *P. badius* and *C. polykomos*, respectively, and up to 15 microsatellite markers. We found high levels of genetic diversity in both species, especially the red colobus, and subtle levels of genetic differentiation within each species. These results highlight their high dispersal ability and suggest a putative long-term viable population, as already noticed for other populations of the taxa. A deeper investigation, particularly with mitochondrial DNA sequences, will allow for a more accurate assessment of the status of these two populations.

Seasonal Variation in Activity Patterns of Blue Monkeys (*Cercopithecus mitis*) Living on a Small Island off Mozambique

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Blue monkeys are widely distributed in Africa, living in both temperate and tropical climates and showing high behavioural flexibility. Especially in tropical climates, they are reported to maintain a high level of feeding activity and a low variation in their activity patterns throughout the year. To better understand the flexibility of this species' behaviour, we studied a habituated group of these monkeys ($n=25$) living on a small, tropical and seasonal island off Mozambique. To our knowledge, this species had never been studied before on a small island (~14 km²). From October 2018 to February 2019 (2.5 months of dry and 2.5 months of rainy season), we collected data on the group's activity patterns using scan sampling ($n=16,431$) during 1015 observation hours. We found that feeding and drinking were significantly higher in the dry season, whereas resting, moving, playing and grooming were significantly higher in the rainy season. The diurnal activity pattern of the group was characterised by a morning and evening feeding peak and a midday resting period. Our study group exhibited more variable activity patterns than those previously reported for the species. This variability seems to be influenced by the marked seasonal changes in food and water availability on the island, especially during the dry season when food and water resources were scarce. Our results confirm the behavioural flexibility of blue monkeys, which seemed to modify their activity patterns according to the seasonal changes of resources on the island. However, it is necessary to collect data for a whole year to understand better how the activity patterns of the species differ between seasons.

Wild Chimpanzee (*Pan troglodytes verus*) Attacks on Children in the Republic of Guinea-Bissau

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“Attacks” on humans by chimpanzees are a rare pattern of behaviour. However, as natural habitats become more and more humanised encounters between species also become more frequent. The present research reports several “attacks” ($n=5$) that took place in the Republic of Guinea-Bissau outside a protected area (Cufada Lagoons Natural Park) in 2016. Although previous “attacks” had occurred in 2011 and 2012 and after (2017 and 2018) in other areas of the country and towards adult individuals, “attacks” reported in this presentation were all directed towards children. The context of each “attack” was recorded for both chimpanzees and children.

Children were interviewed via an in-depth interview technique specifically about the events, from the time they entered the forest until the episode finished. Children were also measured and photographed. Episodes were qualitatively analysed from the chimpanzee behaviour point of view (“resource/food competition”) and from the human/children’s point of view (chimpanzee “attack”). Children who were bitten were photographed and medical procedures were discussed with the physicians involved, especially when children lost toes, fingers or were somehow disfigured after the “attacks”, which happened with some children in all 4 episodes. While some traditional (and local) narratives pinpoint the possibility of sorcery behind such “attacks”, forest clearance associated with the lack of wild food are explanations that cannot be discarded. Landscape changes (e.g. deforestation) can negatively impact the ability of chimpanzee communities to survive and may potentiate agonistic encounters between species.

New Evidence of Play Therapy Bringing Behavioural Benefits Within a Captive Group of Chimpanzees (*Pan troglodytes*)

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Animal welfare in captive environments is becoming a paramount concern in *ex-situ* conservation and has been the focus of many recent studies. Several ways of enhancing behavioural, psychological and physiological welfare have been reported in the past decades. The current study tested the general effect of a new methodology of behavioural management, named play therapy, on the welfare, behaviour and mental domains of a captive group of 7 chimpanzees (*Pan troglodytes*) at Barcelona Zoo. Individual welfare was assessed via output-based measures of behaviour by using continuous scan sampling to monitor the subjects from the general exhibit at baseline, test and follow-up conditions. Individual focal watches lasted for 10 minutes and were followed by a 2-minute break. Both frequencies and durations of behaviours were analysed by using generalised linear mixed models (GLMM). Results reveal a significant generalised drop in deficient and abnormal behaviours ($\chi^2=15.67$; $df=2$; $p<0.001$) along with a rise in prosocial and positive behaviours during the implementation of the play therapy ($z=5.557$; $p<0.001$). A rise in self-directed behaviours explained by a growth in locomotion behaviours was also observed ($\chi^2= 12.50$; $df= 2$; $p<0.001$). This research adds support to the sound benefits of positive human-animal interaction on animal welfare, but more specifically to the play therapy as a behavioural management technique, which encourages the expression of positive welfare effects into daily management of primates kept in a zoo environment or under human care.

Notes on the Colonisation of the Bijagós Archipelago, Guinea-Bissau, by *Cercopithecus campbelli* and *Chlorocebus sabaues*

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The colonisation of insular systems by non-human primates is rarely studied. The Bijagós Archipelago (BA) is comprised of 88 islands located off the shore of Guinea-Bissau. Of the 3 guenon species occurring in the archipelago, 2 – *Cercopithecus campbelli* and *Chlorocebus sabaues* – have confirmed mainland occurrence. The objective of this work was to investigate the most probable mainland origin of these populations. We used 60 DNA fragments of the mitochondrial cytochrome b gene and the mitochondrial control region obtained from non-invasive samples collected in the BA and in 4 protected areas across the southern mainland distribution of both species. We estimated the genetic diversity and the phylogeographic structure (phylogenetic reconstruction and multivariate analyses). Insular populations had lower levels of genetic diversity. Samples from BA and the Cufada Lagoons Natural Park were genetically equal (*C. campbelli*) or closely related (*Chl. sabaues*), pointing to Quínara region as the most probable source. A recent colonisation of the BA was suggested, which contradicts the time proposed of a physical connection between the archipelago and the mainland (~12 KYA). Based on historical records of the *bijagó* ethnic group, we discuss the hypothesis of human-mediated colonisation, namely during the migration of the ethnic group from the Quinara region to the BA (XIIth century) or the slave-trade period (XV-XVIIIth centuries). Further work is planned to estimate the most likely colonisation scenario using genomic tools. Funded by Foundation for Science and Technology (PTDC/IVC-ANT/3058/2014), The Born Free Foundation, Chester Zoo, PCI and four Portuguese enterprises.

Looking for Visitors' Effect in Sanctuaries: Implications of Restricted Visitor Activity on the Behaviour of the Chimpanzees at Fundació Mona

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The question of whether and how captive primates are affected by visitors has gained increasing attention in the 21st century. Although most studies have reported undesirable effects on the behaviour and welfare, several of them have reported contradicting results. Most of these studies were conducted at zoos, typically with little or no control over visitors' actions. Yet little is known about the impact under controlled visitor conditions. Therefore, we conducted this study at the primate rescue centre Fundació Mona (Spain), which allows only limited public access via guided visits under strict supervision. We recorded the behaviour of 14 chimpanzees living in

2 groups during, after and in the absence of guided visits over a 10-month period (265h of observations from March 2018 until January 2019). A total of 38,700 behaviours have been recorded using 2-minute multifocal instantaneous scan sampling (average of $2,766 \pm 710$ behaviours per individual). Furthermore, we categorised the visitor groups regarding their size and composition to see if certain group types would produce a stronger impact. As expected, we found that strictly supervised visitors produced a neutral impact on the chimpanzees' behaviour, producing only a slight increase in locomotion and decrease in inactivity during visitor activities, with chimpanzees demonstrating more interest towards bigger groups. We argue that the impact has been greatly mitigated by the strict visitor restrictions and management strategies that allow chimpanzees to have a sense of control regarding their visibility.

Social Grooming Networks of Former Pet and Entertainment Chimpanzees are Shaped by Previous Experiences and Alterations of Group Composition

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Deleterious experiences, particularly during infancy, are known to affect the social development and wellbeing of human and non-human primates in the long-term. While this process is relatively well-studied in humans and former laboratory chimpanzees, information on this regarding former pet and entertainment chimpanzees is sparse. Therefore, we investigated the long-term effects of adverse early life experiences on 18 former pet and entertainment chimpanzees, based on social grooming data collected over a 12-year period at the primate rescue centre Fundació Mona (Spain). We used 2-minute multifocal instantaneous scan sampling to record their behaviour, obtaining a total of 303,123 behaviour entries, which were filtered for social grooming. Furthermore, we also focused on short-term reactions to alterations to the group composition. As such, we analysed the standardised grooming activity and distribution of grooming among group members for each individual during stable and unstable periods (i.e. when alterations to group composition occur). We found the origin (captive born vs. wild-caught) and "predominant access to conspecifics during infancy" (with vs. without) to affect the social grooming activity and distribution in the long-term. Furthermore, chimpanzees, regardless of their adverse background conditions, reacted to alterations of the group composition by restricting their grooming distribution, but reverted back to a less choosy distribution after a few months. Thus, we conclude that the social grooming networks of former pet and entertainment chimpanzees are affected not only by the present social conditions and care management strategies, but also by adverse experiences and inappropriate living conditions in the past.

(*These authors contributed equally to this research and are thus listed alphabetically)

Hand Preference for a Coordinated Bimanual Task in Captive Hatinh Langurs (*Trachypithecus hatinhensis*) and Grey-shanked Douc Langurs (*Pygathrix cinerea*) at the Endangered Primate Rescue Centre (Vietnam)

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Right-handedness among humans reflects the functional brain specialisation of the left hemisphere as a result of evolutionary pressures. To understand better the origins of this population-level tendency, it is crucial to understand manual lateralisation in non-human primates. This study aimed to present the first approach to the hand preference of two primates from Vietnam, the Endangered hatinh langur (*Trachypithecus hatinhensis*) and the Critically Endangered grey-shanked douc langur (*Pygathrix cinerea*). Eighteen individuals from each species ($n=36$) were evaluated with the bimanual coordinated tube task and their responses were recorded using both frequency and bout methods. Our results showed that subjects presented strong individual-level preferences but not lateralisation at the population-level. There were no significant differences among sexes, although hatinh langur females showed a higher left-hand preference than grey-shanked douc langur females. Nevertheless, hatinh langurs showed a higher strength of hand-preferences than grey-shanked douc langurs, exhibiting a possible higher manual specialisation during the leaf-eating process. These findings help to broaden the scarce knowledge on manual laterality of Asian colobine monkeys and confirm that the bimanual tube task is a sensitive measure to assess manual laterality in non-human primates.

Physiological Stress and Personality in Several Species of Non-human Primates

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Recently, the study of “animal personalities” has emphasised the importance of the individual. This shift in focus has been shown as a way to improve the animal welfare assessment. Therefore, in our study, we measured those inter-individual differences in behaviour that are consistent over time and situations, looking at 18 individuals of 8 species of non-human primates (*Callithrix jacchus*, *Callithrix geoffroyi*, *Cebuella pygmaea*, *Saguinus imperator*, *Saguinus oedipus*, *Leontopithecus rosalia*, *Pithecia pithecia* and *Nycticebus pygmaeus*) in terms of (i) personality ratings made by animal keepers, (ii) reaction to novel objects and (iii) faecal cortisol metabolites (measure of physiological stress). We also searched tendencies between the variables that are sex, age or species dependent. The k-means algorithm, Spearman's rank correlations, Wilcoxon–Mann–Whitney tests and general linear models were performed in MATLAB R2018a for Linux.

Personality assessments achieved good levels of inter-rater reliability and revealed 3 components of personality in our sample: fearfulness, activeness and aggressiveness. More exploratory individuals were more active, aggressive and showed higher cortisol metabolite levels. Males were more aggressive, approached novel objects quicker and presented higher cortisol metabolite levels than females. Age of individuals was negatively correlated with being playful. Personality is an important element in the welfare assessment and this study demonstrates its relation with a physiological indicator. However, although some aspects can be generalised across species and/or sexes, others are species/sex dependent.

Hunting and its Recent Demographic Consequences in *Papio papio* in Guinea-Bissau Assessed Through Social and Molecular Data

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Guinea baboons (*Papio papio*; IUCN: Near Threatened) have been reported to be extensively hunted over the last few decades in Guinea-Bissau, but the hypothesis of population decline has not been tested. We reconstructed the recent demographic history of the baboons' population, using social and molecular data. The content of 8 interviews of hunters from the Cufada Lagoons Natural Park and the Cantanhez National Park was analysed qualitatively to describe the hunters' behaviours, techniques, motivations and perceptions of the effect of human activities on recent demographic dynamics of wildlife, and in particular of the Guinea-Bissau baboons. Additionally, we used the most geographically broad microsatellite loci dataset produced to date for the southern range of the species ($n=199$ unique genotypes for 15 STRs) to explicitly test for a recent population reduction using molecular data. Hunters described that baboons were hunted, using firearms, traps or dogs, for the meat trade and consumption or the pet trade. Episodes in which militia "filled up trucks with baboons" as a replacement for their salaries during periods of political instability were described. Social data gathered by this study suggest a hunting-related demographic decline and/or avoidance of human facilities by baboons, agreeing with what has been reported by other authors for the same region. However, the demographic reduction of the population could not be confirmed using molecular data. Our study highlights the importance of using a combination of social and molecular data to investigate recent impacts of anthropogenic activities on primate populations.

Death Among Primates: the Role of Thanatological Interactions Between Non-human Primates

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Awareness of death, along with language, culture and art, has been considered a defining trait of our species. We reviewed 200 years of evidence regarding thanatological responses in non-human primates and organised it into distinct terminologies: *direct interactions* (physical contact with the corpse) and *secondary interactions* (guarding, vigils and visitations). Dead-infant carrying ($n=110$) was reported mainly in catarrhines, while strepsirrhines and callitrichids ($n=17$) have not been reported as engaging in this behaviour. Thanatological interactions are generally considered to be a by-product of attachment relationships that foster empathic and caregiving behaviours and operate on the expectation that the dead individual could recover. However, assuming primates learn valuable information from corpses, these interactions may serve an evolutionary purpose. Non-human primates could be gathering information on the conspecific's state, promoting a faster re-categorisation from living to dead, reducing costly vigilant/caregiving behaviours, being crucial to the management of grieving responses, updating ranks in the group's hierarchy and accelerating the formation of new social bonds. The main strategy primates use is consistent with the "wait-and-see"/"learning-about-death" hypothesis. Since research on human acquisition of the concept of death relies on verbal communication and is, therefore, unsuitable for non-human animals, we propose an *integrated model of life-death awareness* that not only supports a gradual acquisition of such concepts but also suggests a few underlying processes governing it.

Studying Primate Cognition in a Novel Way: ManyPrimates, a Large-scale Collaborative Project

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To reconstruct the evolutionary history of primate cognitive capacities requires comparative studies including large numbers of individuals from many different species. However, traditionally, this has been a difficult problem to overcome in comparative psychology and, consequently, studies have been usually limited to few species and low sample sizes that prevent large-scale comparisons. In order to solve such problems, we have created the *ManyPrimates* project, a large-scale collaboration with the aim of conducting comparative studies on primate cognition. Currently, *ManyPrimates* includes 11 institutions in 4 continents and is growing. To test the viability of the project, we conducted a pilot study on short-term memory, generating the most comprehensive and comparable dataset of this capacity to date. *ManyPrimates* demonstrates that a large-scale collaborative project, which includes institutions in different continents without specific external funding for its implementation and which builds an infrastructure capable of conducting studies on a long-term basis, is feasible. The path to successful collaboration in such a large-scale project is not without problems, as methodological and logistical challenges need

to be overcome. However, the infrastructure we have developed in *ManyPrimates* permits the standardisation of methodologies and protocols that will generate large and ever-expanding datasets to allow for systematic comparisons within and across species. Thus, *ManyPrimates* has the potential for the inclusion of a growing number of individuals and species, allowing us to conduct robust comparative analyses and contribute to understanding the evolution of primate cognition in an unprecedented way.

Behaviour and Adaptation of Hatinh Langurs (*Trachypithecus hatinhensis*) in a “Semi-wild” Enclosure in EPRC (Vietnam)

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The Hatinh langur is one of the limestone langurs, which lives in Central Vietnam, on the border with Laos. The Hatinh langur is listed as Endangered, but very little is known about the species. We have two main goals. Firstly, to provide data that contribute to improved knowledge of this species and, secondly, to carry out a behavioural evaluation of different subjects ($n=3$) to see if they are fit to be reintroduced into the wild. This second objective is linked with the reintroduction project that has been carried out since 2007 by the Endangered Primate Rescue Centre. In a 5 hectare “semi-wild” enclosure in the EPRC, individuals were observed daily from October 2018 to February 2019. An evaluation model was designed with different evaluation criteria, such as behavioural aspects, which were later compared with the behaviour of individuals (same genus) living in the wild. We collected almost 300 hours of behavioural data using the continuous scan sampling method every 10 minutes. We conclude that the subjects present an activity budget very similar to that of other species of their genus in the wild, even though they exhibit small behavioural differences regarding locomotion and social interactions. Therefore, we conclude that the subjects are ready to be reintroduced into the wild, with a good chance of survival.

What Do We Know About West African Red Colobus? Inferences from Multidisciplinary Data

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The red colobus monkey *Ptilocolobus badius* is severely affected by the rapid pace of forest loss and fragmentation. Its long-term survival is highly compromised by the increasing human exploitation of the forest resources, either through the alteration of suitable habitat or

due to targeted hunting for commercial bushmeat. Here, we present a decade of multidisciplinary research applied to the conservation of red colobus populations across several West African countries. Through combining, genetic, genomic and behavioural data we have found different levels of threats for different populations, supporting the idea that populations of the same species may have different conservation needs. Whereas populations from Guinea Bissau, and Cantanhez National Park specifically, are under high levels of threat, being targeted for commercial bushmeat hunting, showing critically low current effective population sizes and a recent population collapse likely attributable to the human exploitation of forest resources, others, like the population from Tai National Park in Ivory Coast, show high levels of genetic diversity with historically large and stable populations. The genomic information recovers a more ancient population demography and illustrates how red colobus populations have responded to past fluctuations of forest cover. Through understanding the current and past population dynamics, we can better address the conservation challenges that specific red colobus populations are facing across highly anthropogenically impacted landscapes.

The Influence of Personality on Chimpanzees' Performance in Cognitive Tasks

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Personality has been linked to individual variation in interest and performance in cognitive tasks. Nevertheless, this relationship is still poorly understood and has rarely been considered in animal cognition research. We investigated the influence of personality on task performance in 13 chimpanzees (*Pan troglodytes*) housed at Fundació Mona (Spain). Personality was assessed with a 12-item questionnaire based on Eysenck's model and completed by familiar keepers and researchers. Experimental tasks were 11 puzzle boxes that needed to be manipulated in order to obtain a food reward. We considered success and latency to solve the task as measures of performance, and participation and dropping out as indicators of interest and motivation. Data analyses were conducted using generalised linear mixed models. Participation was associated with higher Dominance in males, but the opposite was observed for females. Success was related to both lower Extraversion and Dominance, and to higher Neuroticism in females. Chimpanzees higher in Neuroticism were also more likely to drop out. Latency was not affected by any personality trait. These findings highlight the importance of considering personality in the context of cognitive testing, suggesting that subjects' performance can be affected by individual differences that may not be directly related to cognitive abilities.

Primate-Focused Community Conservation Initiatives in Northern Peru

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Neotropical Primate Conservation (NPC) was established in 2007, in part to work with local communities to implement land protection projects conceived and designed in their area of application in the north of Peru. In 2008, and again in 2009, NPC organised regional workshops inviting the participation of local people from surrounding communities. NPC offered their help to establish protected areas (PAs) in or near community lands using Critically Endangered and endemic primate species as conservation flagships. To date NPC's Community Conservation based approach has led to the establishment of 11 locally run protected areas, totalling ~100,000 ha, and has supported the protection of additional areas totalling >500,000 ha. Transect surveys in 2008/09 and 2012/13 showed that populations of the yellow tailed woolly monkey (*Lagothrix flavicauda*) at one site have increased by ~30% and a newly discovered population of San Martin titi monkey (*Plecturocebus oenanthe*) has naturally re-established itself at a second site. Satellite image analyses has shown that deforestation rates in and around community PAs are also now significantly lower than in other regions of Peru where non-community-based conservation takes place. Community Conservation methodologies in northern Peru have led to a substantial increase in land protection and a reduction of environmentally damaging practices. However, government inefficiencies and contradictory development strategies continue to hinder these processes.

Greeting and Leave-taking Signals in Chimpanzees of the Bossou Community

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Wild chimpanzees (*Pan troglodytes*) form large communities, but split into smaller fluid parties during daily activities, with individuals moving freely between them. Within this 'fission-fusion' social organisation, chimpanzees compete for social rank and form long-term alliances with both kin and non-kin group members. In human fission-fusion societies, ritualised signal exchanges are observed at both arrivals (greetings) and departures (leave-takings). However, in chimpanzees only greetings have been reported. These events may play an important role in the formation and maintenance of social relationships. When two individuals encounter each other, greeting behaviour may transmit valuable information, such as changes in relative social rank. Over 30-years of video records exist for the Bossou chimpanzee community. These include detailed records of individuals within and arriving at a party. We analysed 100 arrivals and 100 departures. We describe the presence and form of signals used during these events and explore how individual characteristics, role and relationships, as well as the composition of the audience, shaped communication during arrivals and departures. A large number of interactions occurred during arrivals and the quality of signals exchanged varied with individual and group factors; however, interactions during departures were scarce, suggesting that leave-takings do not occur in this primate species.

Dominance Rank, Agonistic Behaviour and Spatial Distribution in a Captive Group of Drills (*Mandrillus leucophaeus*)

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Dominant relationships between group members are considered an important factor that affects the social structure of primate societies, which can be analysed through behavioural studies. In this research, we studied the hierarchy of a captive group of 6 drills (*Mandrillus leucophaeus*) from Barcelona Zoo as exhibited by aggressive behaviour and the spatial distribution of the members of the group. The results showed a higher frequency of threatening behaviours than of aggression with physical contact. Moreover, there was a tendency to a linear organisation with the dominant individual being the only adult male of the group. Following the Hemelrijk (1998) model, we described an ambiguity-reducing attack strategy, and we investigated the centrality of the dominant individual with a Kendall rank correlation between the rank of the members of the group, and their spatial distribution. As expected, the dominant male did not present centrality in respect to the other members. Using the spatial distribution data, we also studied the individuals' preferred areas of the enclosure, and we found that they spent more time in areas that were central and had enrichment items. This study demonstrated that agent-based models are useful for predicting complex behaviours in primates. It also provided information that can be helpful for ensuring the wellbeing of the studied group, and contributed to the improvement of the current knowledge of the species.

Ranging and Strata Use of *Cercopithecus mitis* Living on a Small Island off Mozambique

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Both the distribution and abundance of food and water sources affect the ranging patterns of primates and living in a small or fragmented habitat may reduce daily path lengths and home range areas. Blue monkeys (*Cercopithecus mitis*) have a high ecological flexibility, and we aimed to investigate how living on a small, seasonal island (14 km²) may affect their ranging patterns. We collected ranging and strata use data on a habituated group from October 2018 to February 2019, covering 2.5 months of each dry and rainy season. The home range area of our study group ($n=25-30$) was smaller than those previously reported (36.70 ha) but its daily travel distances were the highest ever recorded for the species (3,550 m). Seasonality did not significantly affect the home range size or travel distances of the studied group. Although blue monkeys are considered to be mainly arboreal, members of our study group spent most of their time on the ground,

especially during the dry season, when they more frequently foraged for food on the ground. The absence of potential natural predators on the island may facilitate the use of the ground level. We observed several episodes of aggressive interactions between our study group and neighbouring groups, suggesting the existence of intergroup competition. The studied blue monkeys preferred to use human modified zones in both seasons, mainly for feeding and drinking. Together, our results suggest that the group ranging and strata use patterns reflect a strategy to maximise food intake in a habitat with, presumably, low abundance of foods, potentially high intergroup competition and which was restricted by seawater boundaries.

Socioecological Changes in Non-human Primates in Response to Anthropogenic Changes

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Non-human primates' habitats are currently facing an exponential increase in anthropogenic pressures and disturbances. Human interventions into natural environments, through habitat fragmentation, agricultural growth, bush-meat hunting, pet trade and spatial encroachment, create new environmental pressures and threats that interact with the naturally occurring socio-ecological behaviours of non-human primate species. Understanding the way in which these species respond to these novel challenges is, thus, crucial to determine their ability to adapt and survive under this unprecedented environmental transformation. The purpose of our work is to review and summarise the most significant behavioural responses and socio-ecological adaptations exhibited by non-human primate populations inhabiting urban and rural anthropogenic environments. Additionally, the cross-species behavioural patterns and correlations that emerge from this initial analysis present an equally relevant contribution, not only to the species conservation, but also to the general understanding of the biological and evolutionary determinants of primate behavioural plasticity. We found changes in time-budgets, ranging behaviour, dietary composition, group structure and social behaviour across several primate taxa spread across the 3 continents where they are distributed. For example, through an examination of the collection of data concerning time-budget behavioural changes, there is a clear cross-species pattern (e.g. rhesus macaques (*Macaca mulatta*); yellow baboons (*Papio cynocephalus*); vervet monkeys (*Chlorocebus pygerythrus*)) that indicates general increases in resting, grooming and socialising time, to the detriment of feeding time, in provisioned, semi-provisioned or tourist frequented contexts. Modern conservation interventions and endeavours need to incorporate research regarding the natural adaptability potential of threatened species into direct measures of non-human primate protection.

Maternal Care in Relation to Offspring Sex and the Physical Condition of the Mother in *Alouatta palliata*

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The Trivers-Willard hypothesis (TWH) predicts that maternal care should vary according to offspring sex, depending on maternal physical condition and on the impact of maternal investment on offspring reproductive success. Mantled howler monkeys (*Alouatta palliata*) meet the assumptions of the TWH: sons are energetically more expensive and have a greater variance in fitness than daughters. Our aim was to determine if there were differences in maternal care in relation to offspring sex and maternal physical condition in mantled howler monkeys living at the Los Tuxtlas region (Veracruz, Mexico). Between December 2017 and January 2019, we studied mother-infant interactions in 21 dyads with focal-animal sampling and continuous recoding during 8-h periods ($n = 209$ h, with a mean \pm SE of 8.7 ± 4.41 h per dyad). We also performed genetic analysis to determine offspring sex and measured C-peptide in urine samples of mothers to evaluate their physical condition. Offspring sex was a good predictor of maternal care. On average, sons spent more time in ventro-ventral and generic contact with their mothers than daughters, a result that supports the TWH. There was a positive relationship between the physical condition of the mother and the time of generic contact and proximity with the offspring. These results converge with predictions of sex allocation theory and indicate that maternal care is influenced by the sex of the offspring and the physical condition of the mother.

Poster Presentations

Behaviour of Three Species of Neotropical Primates in a Rescue Centre

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The escalating anthropogenic pressures on Neotropical primates and their habitats means that many species arrive at rescue centres. On the Caribbean coast of Costa Rica, we compared the behaviour of 17 individuals of 3 different monkey species in the Jaguar Rescue Centre: 5 capuchin monkeys (*Cebus capucinus*), 9 howler monkeys (*Alouatta palliata*) and 3 spider monkeys (*Ateles geoffroyi*). The study was carried out between the months of June and August 2017.

Data collection involved individual daily focal sampling using a one-zero record for 5 minutes for 28 days, but first *ad libitum* sampling was carried out through continuous recording of 30 h for 15 days. General linear models were used for statistical analysis. The results obtained indicated that capuchins spent 16% and 11.4% more time being active than howler and spider monkeys, respectively. Howler monkeys spent 4.4% and 13.3% more time eating and were 8.1% and 8.8% more inactive than spider monkeys and capuchins, respectively; Spider monkeys spent 1.8% and 1.7% more time on socio-negative behaviours than capuchins and howler monkeys, respectively. These differences seem to be due to the different energy requirements and social structures of each species.

What Can We Learn About Dominance and Reconciliation in Chimpanzees?

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Chimpanzees (*Pan troglodytes*) are gregarious animals with strategies in place to avoid competitive situations. Nevertheless, conflicts among group members still occur. When a conflict arises, this species has further coping mechanisms known as post-conflict behaviours. Said behaviours aim to reduce the accumulated social tensions, via means of affiliative or aggressive conducts, for instance, reconciliation. Furthermore, when living in a group there is a need for individuals to situate themselves in the social hierarchy. In this study, we investigated whether individual and dyad reconciliation tendency varied with personality, gender and mean conflict duration. We additionally assessed whether dominance rank varied with individual reconciliation tendency, personality, gender, age and the relative frequency of affiliative behaviours. We collected data on 14 chimpanzees housed at Fundació Mona (Girona, Spain), between 8th February 2019 and 13th April 2019. Results showed that males tended to be more dominant than females, and dominant individuals consistently presented a higher frequency of affiliative behaviours, regardless of context (post conflict *versus* matched control). None of the other variables are correlated with reconciliation tendency or with dominance rank. Our findings support the 'policing hypothesis' whereby dominant individuals have a higher interest in maintaining group cohesion (in this case, through affiliative behaviours).

Social Behaviour in a Captive Group of Barbary Macaques (*Macaca sylvanus*): Relationships between Dominance, Hierarchy and Use of Space

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As is the case for humans, most primate species live in complex social systems. Group life has costs and benefits, and to deal with it, dominance arises. We wanted to ask whether the social system of 4 Barbary macaques (*Macaca sylvanus*) with a history of maternal separation was affected by their upbringing and if it differed from their wild counterparts. We collected behavioural data (solitary and social) for one month at Fundació Mona (Spain) in order to identify the social organisation of the group (73.3 h total observation). We focused this exploratory study on dominance behaviour to determine its possible relation to the hierarchy within the group, and its influence on feeding behaviour and use of space. The results showed that the subjects invested more time in solitary activities rather than social, evidencing a social impairment that may underlie a lack of group cohesion. Concerning dominance behaviour, we found that it did not differ significantly from that of their wild neighbours. Further, leadership was not influenced by dominance behaviour, but affected access to and distribution of feeding resources and to a greater use of the space. Identifying the zones of the enclosure preferred by the individuals can lead to future improvements in environmental enrichments and, consequently, the welfare of the individuals.

The Impact of Anthropogenic Activities on Faecal Cortisol and T3 on Wild Chimpanzees (*Pan troglodytes verus*) in West Africa

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Our objective was to measure faecal cortisol metabolites of chimpanzees from Réserve Naturelle Communautaire de Dindéfelo (Senegal) to assess if anthropogenic activities had an impact. If the physiological stress of chimpanzees increases in the months and areas of greatest anthropogenic impact, then it would reduce their welfare. Fresh faecal samples ($n=155$) were collected in 4 sites with different characteristics (fires, crops, human pressure and control) from 2014 to 2015. The analysis of faecal cortisol was performed by Enzyme-Linked ImmunoSorbent Assay (EIA) and a validation protocol was performed. The curves with standard and faecal samples showed parallel displacement. T3 hormone analysis was also performed to assess nutritional stress. It has been found that the months of study had a significant effect on hormones ($p < 0.0001$); however, within the months, there was no effect of the sites ($p=0.1336$). The effect of the months may be related to anthropogenic activities like the competition with humans for water and fruits of the forest. There was a relationship between lack of food and nutritional stress. Thus, faecal cortisol and T3 metabolites analysis is a valid tool to assess chimpanzees stress and wellbeing.

Tourist and Local People Use of a Savanna Chimpanzee (*Pan troglodytes verus*) Habitat in Dindéfelo, Senegal

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Tourism can have a positive impact for conserving natural areas but also a negative one on the environment and animal populations. Specifically, proximity between people and great apes increases the potential for disease transmission and alters the apes' natural behaviour. A well-known national and international tourist attraction in Senegal is the waterfall "Grande cascade", located within the Dindéfelo Community Natural Reserve, where a savanna population of the Critically Endangered West African chimpanzee lives. During the time of maximum tourist presence, chimpanzees visited the waterfall area to access food, water and shade, converging with tourists. Local people traditionally use the waterfall area for hygiene and recreational water-related activities. Usually, the number of visiting tourist groups per day and the number of people per group are controlled in protected natural areas where great apes live. Though the waterfall area is not designated for chimpanzee tracking (which is done in a different area of the reserve), tourism in the waterfall area is not fully controlled. The aim of this study was to record the number of tourists and local people who visited the waterfall during the time of maximum tourist presence. We collected data daily between 07:30 and 18:30 from March to July 2015. A total of 7911 tourists and 4780 locals were counted during this period. Groups ranged from 2 to 150 people. We conclude that tourism in the waterfall area needs to be better regulated and new conservation strategies should be explored to prevent conflict and potential disease transmission between humans and non-human apes.

Assessing Interspecific Relationships Between Two Species of Captive Lemurs (*Lemur catta* and *Varecia variegata*) with Network Analysis

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Interspecific relationships are present in many non-human primate species. Different species of lemurs are usually housed together in the same zoo enclosures. Consequently, assessing the affiliative and agonistic interactions between these animals may be important for management decisions. For this reason, the aim of this study was to describe the social network in 1 group of captive lemurs that included 2 different species: ring-tailed lemur (*Lemur catta*, $n=4$ individuals) and ruffed lemur (*Varecia variegata* $n=3$ individuals). The initial hypothesis was that individuals from the same species will spend more time together. Thus, the enclosure was divided

in 4 zones and we continuously recorded the area where each individual was. All the lemurs in the group were videotaped and simultaneously recorded. The total time of visual observation was 8.17 h. As a result, it was possible to establish a network in which the nodes are the subjects and the edges represent the percentage of time spent in the same area. However, we considered only the connexions that involved more than the 20% of the observation time. As was expected, individuals from the same species were strongly connected in the social network. This means that clear interspecific relationships were not found in the spatial distribution of these lemurs. This is supported by the fact that no interspecific affiliative interactions were observed in this study.

Assessment of a Cognitive Feeding Enrichment Task in Two Endangered Species: Hatinh Langur (*Trachypithecus hatinhensis*) and Grey-shanked Douc Langur (*Pygathrix cinerea*) at the Endangered Primate Rescue Centre (Vietnam)

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Cognitive enrichment has recently become popular as a strategy to promote the psychological wellbeing and long-term welfare of animals under human control (e.g. rescue centres, zoos). This study provided novel information about how the Endangered Hatinh langur (*Trachypithecus hatinhensis*) and the Critically Endangered grey-shanked douc langur (*Pygathrix cinerea*) reacted to a Cognitive Feeding Enrichment Task (CFET) at the Endangered Primate Rescue Centre in Vietnam. We collected behavioural responses using instantaneous scan sampling during a baseline phase, a treatment phase (while delivering the CFET) and a post-treatment phase to study the effect of the different phases, species and sex. All of the subjects ($n=38$) were exposed to the CFET. Descriptive statistics showed that 92% of the langurs chose to interact with the feeding task, but individual responses and adaptation periods differed. Generalised linear mixed models showed the following results. *T. hatinhensis* spent more time performing locomotion and vigilance than *P. cinerea*, which showed higher feeding and inactivity behaviours. Females ate and socialised more frequently than males, while males showed more frequent locomotion, vigilance and inactivity. During the treatment phase, individuals fed less and rested and socialised more. These observations are in line with previous studies about the behavioural biology of Asian colobine monkeys, namely that the longer resting periods related to their complex leaf-digestion process.

Laterality and its Connection with Stress in Several Species of Non-human Primates

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Cerebral lateralisation has been suggested to have practical implications to improve animal welfare with the left and right sides of the brain specialised to process information in different ways and to control different categories of behaviour and emotions. Combining it with other indicators, strong validation of results could be obtained. In our study at Faunia Zoo (Madrid, Spain), we used hand preferences for simple reaching during normal feeding times as a measure of lateralisation, and faecal cortisol metabolites (FCM) as physiological measure of stress in 8 species of non-human primates: *Callithrix jacchus* (3 males), *Callithrix geoffroyi* (2 males), *Cebuella pygmaea* (1 male, 1 female), *Saguinus imperator* (2 males), *Saguinus oedipus* (1 male, 1 female), *Leontopithecus rosalia* (2 males), *Pithecia pithecia* (2 males, 1 female) and *Nycticebus pygmaeus* (1 male, 1 female). The handedness index score (HI), its absolute values (ABS-HI) and the binomial Z-score were used. An individual was considered to have a significant hand preference if the Z-score was ≥ 1.96 or ≤ -1.96 ($p < 0.05$). Analysis revealed that 15 of our subjects presented a strong hand preference (8 subjects were right-handed and 7 left-handed), while 3 individuals were identified as ambi-preferent. The strength of the lateralisation, independent of the direction, was positively correlated with physiological stress. This study shows evidence of a relation between stress and lateralisation for these non-human primate species although more empirical research is needed to explain it.

Prevalence of Intestinal Parasites in Endangered Ashy Red Colobus Monkeys (*Ptilocolobus tephrosceles*) in Tanzania

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Intestinal parasites constitute one of the most frequent causes of gastrointestinal diseases in primates, directly affecting their health. We sampled 3 populations of the Endangered ashy red colobus monkey (*Ptilocolobus tephrosceles*) with different levels of anthropogenic disturbance in Tanzania. We collected faecal samples ($n=157$) soon after defecation and fixed them *in situ* in

70% ethanol. We then re-fixed half of each sample in MIF (merthiolate iodine formaline) for microscopic study and saved the rest for molecular analysis. We examined helminth eggs, larvae and protozoan cysts using a light microscope after faecal sedimentation. We analysed samples positive for *Giardia* using Polymerase Chain Reaction (PCR) to determine genotypes. The overall prevalence of protozoan and helminth infection was 94.3% (148/157), with 64.9% (96/148) being infected by 1 species, 25.7% (38) by 2 species, and 9.5% (14) by 3 or more species. We detected 8 species of intestinal parasites: *Ancylostoma* sp. (13.4%), *Trichuris trichiura* (3.8%), *Strongyloides stercoralis* rhabditoid larvae (2.5%), *Entamoeba chatonni* (82.8%), *Iodamoeba butschlii* (14%), *Endolimax nana* (4.5%), *Blastocystis hominis* (2.5%) and *Giardia duodenalis* (14%). These species were detected in different combinations in the 3 areas, while *Giardia* was detected in only 1 area. The molecular analysis of positive *Giardia* samples showed that all of them belonged to assemblage B, which could also infect humans. However, we could not identify an exclusively anthropogenic origin of the parasitic species found. Our study contributes to our knowledge of parasitic infections in ash monkey in Tanzania, allowing us to assess their health status and disease risk, which in turn will help us design more successful conservation strategies for this Endangered primate in Tanzania

Identification of Suitable Reintroduction Sites in China for *Nomascus* Gibbons, using Maximum Entropy Modelling

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Present in historical records, as far north as Gansu and east to Zhejiang, Chinese gibbons are now present only in Tibet, Guangxi and Yunnan in mainland China. Both human population expansion, and associated habitat loss and hunting, and climate change have been implicated in this range decline. Many of the remaining populations are small and fragmented, and translocations and reintroductions are already being considered by the Central Chinese Government. This study used 21 modern (last 20 years) presence localities for mainland Chinese *Nomascus* species (*N. nasutus*, *N. concolor* and *N. leucogenys*) across their range in mainland China, Laos and Vietnam, along with 19 bioclimatic datasets (WorldClim) to predict and map suitable climatic regions for reintroductions using Maxent software (Version 3.4.1). The model predicted no suitable climate for *Nomascus* outside of Yunnan due to increased temperature seasonality elsewhere in China. The southwest corner of Yunnan, below Lincang and left of the Red River, was determined as the optimum location in China for reintroductions. This region has a climate highly similar to that experienced by current populations, and spatial data indicates low human population densities (<100/km²) and numerous large patches (>60km²) of evergreen broadleaf forests capable of holding viable population sizes. Returning gibbons to these forest patches is not only beneficial for gibbon conservation, but for restoring the presence of important seed dispersers in Chinese forests. It is recommended that the results of this study should be used to guide ground surveys to further investigate human disturbance and vegetation suitability in this region.

Local Human Perceptions Towards Primatology Researchers in Cantanhez National Park, Guinea-Bissau

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Many have been the local human communities on the African continent who have received primatologists in their midst. Several studies report on the encounter and the vision of these researchers in these communities. On the other hand, few studies have focused on how these local communities relate to and perceive these foreign researchers. The Cantanhez National Park (CNP) in southern Guinea-Bissau is no exception and has received numerous primatologists, particularly since the 2000s. How is the relationship between local communities and these researchers? What do people in these local communities think of these “others”? The present study was carried out in 5 “*tabankas*” (*i.e.* villages) of CNP: Cadique Nalu, Caiquene, Madina, Iemberem and Lautchande. Using quantitative research techniques, questionnaire surveys ($n = 100$) were undertaken in June 2018. Results show that 75% of the respondents affirmed the presence of the researchers as positive, while 93% said that the results of their research should be returned to the communities. Moreover, 56% stated that the primatologists’ presence does not bring direct benefits to the community since only the people who belong to or are close to the park management benefit. This type of information is relevant since it can help a better decision of the various actors involved in the design of primate conservation strategies.

Assessing the Stereotypic Behaviours and Enrichment Options Among Captive Primates: a Review

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Stereotypic behaviours are observed among captive primates, with behaviours including locomotor stereotypies (e.g. pacing), self-injurious behaviours (SIB; e.g. eye-poking), coprophagy, and regurgitation and re-ingestion. As stereotypic behaviours are believed to indicate poor welfare in captivity, behavioural, social, cognitive and environmental enrichment have aimed to reduce these behaviours, including socialisation, positive reinforcement, feeding puzzles and enclosure manipulation (e.g. outdoor access, novel toys). However, not all enrichment programmes are successful and their success is dependent upon various intrinsic (e.g. sex, species) and proximate (e.g. environment, cognitive stimulation) factors. A short literary review of 47 articles sourced from Web of Science and Google Scholar was conducted, regarding stereotypic behaviours observed among captive primates, enrichment programmes and their outcomes. Among captive apes, severe cases of post-traumatic stress disorder (PTSD) have been documented within chimpanzees, with SIB and regurgitation and re-ingestion also being commonly observed in bonobos, gorillas and orangutans. Captive monkeys, such as laboratory-housed macaques, typically engage in locomotor stereotypies and SIB. Once established, stereotypic behaviours are difficult

to reduce or eradicate, thus time and patience are required for any enrichment programme. Each recording of stereotypic behaviours among primates should be treated on a case-by-case basis, building upon previous research and knowledge.

Environmental Enrichment as a Rehabilitation Tool Focused on the Reintroduction of a Group of Woolly Monkeys (*Lagothrix lagotricha*)

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Environmental enrichment is essential to zoos and animal rescue centres, mainly for its role in improving the welfare of animals. However, enrichment strategies have also shown potential in other areas, such as the rehabilitation of candidates in reintroduction processes. This study, which aimed to check the effectiveness of enrichment techniques on the recovery of certain natural behaviours, was carried out in an animal rescue centre in the Ecuadorian Amazon. An environmental enrichment protocol was carried out for a group of 8 woolly monkeys (*Lagothrix lagotricha*) living in captivity but intended to be reintroduced in the future. The protocol was based on 4 phases, aimed to select and apply the most effective enrichment techniques for the rehabilitation of the individuals. The effect of this strategy was analysed for several behaviours to check the effectiveness of the protocol itself and the reintroduction perspectives of the study subjects. The applied enrichment techniques led to a decrease in inactivity, a decrease in the time that individuals spent on the ground and an increase in exploratory behaviours. The results of the study demonstrate the effectiveness of the protocol followed and confirm that environmental enrichment techniques can provide beneficial effects in the rehabilitation of captive animals' behaviour.

Rehabilitation and Reintroduction of *Saimiri cassiquiarensis* in the Tamandua Ecological Reserve (Ecuador)

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Despite being a frequent activity in Ecuador, there is a lack of knowledge of reintroduction procedures and little control or monitoring performed. It is, therefore, difficult to find any relevant information about reintroduction in the country. A reintroduction project involving *Saimiri cassiquiarensis* was initiated by Yana Cocha Wildlife Rescue Centre located in Tamandua Ecological Reserve (Pastaza, Ecuador). The goal was to evaluate the survival rate of a group of

squirrel monkeys during reintroduction and to generate protocols for future *Saimiri* spp. reintroductions. Nine specimens from illegal trafficking and zoos were selected. Before being released, they were at the rehabilitation centre for 1 to 2 months, where physical, clinical and ethological assessments were done to check the condition of the individuals following the “Protocolo para el Manejo y disposición” of Suárez (2000). Subsequently, they were monitored 6-8 h/day in the three phases (quarantine, pre-release and post-release), recording activity budget and feeding, in order to evaluate the outcomes of the project. A 60% survival rate was achieved, as well as an increase in the number of behaviours displayed (7 to 18) by the individuals. There was also increase in time spent on behaviours such as feeding (including foraging), observation and interspecies social interaction, and a significant decrease in interactions with humans. This study has found some information gaps and produced a manual and work procedures that can be used. However, it is still necessary to increase the sample size and compare our results with those of other studies to improve and standardise them.

Stressing Captive Primates: the Use of Predator Threat Stressors in Enrichment for Marmosets and Tamarins

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This review paper focuses on the design of effective enrichment devices based on the promotion of stress in captive animals. The main objectives addressed here are: to differentiate between the concepts of «stress» and «distress»; to understand how stressors can be beneficial when developing enrichment; and to establish the main precautions that must be taken when producing these stressors (frequency of the stressor, duration and enclosure characteristics, among others, can trigger unwanted distress reactions). The aim here should lie in developing not imminent, high stressing, short-duration events that allow the primates to gain some control over their situation and predict the threat, fully experiencing beneficial outcomes from the enrichment. Our review focuses on the effectiveness of predator-threat stressors in fulfilling the characteristics of said enrichments. Predation avoidance is understood as an adaptation to survival. We specifically focus on the effects of these stressors on tamarin and marmoset species. Due to them frequently becoming prey in their natural habitat and the complexity of responses these species have developed to avoid it. We observed through the literature review that predation simulations stimulate positive behaviours: training/learning to avoid predators that might occur even in captive enclosures, reproduction of alarm calls that have stress-reducing effects when facing unknown/stressing/distressing situations, and more efficient management of daily budgets and enclosure use. However, these behaviours are biocultural in nature, and, as such, training and socialisation are needed for these species to perform their natural behaviours successfully.

Isotopic Niche Partitioning in Two Sympatric Howler Monkey Species

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Ecological similarity between species can lead to interspecific trophic competition. However, when ecologically similar species coexist, they may differ in foraging strategies and habitat use, which can lead to niche partitioning. In this study, we measured the isotopic niche width, which is a proxy for trophic niche width, of mantled (*Alouatta palliata*) and black (*Alouatta pigra*) howler monkeys in allopatry and sympatry and assessed whether they showed niche partitioning using isotopic measurements in hair. Between 2008 and 2012, we collected hair samples from 200 subjects (115 black and 88 mantled howler monkeys) and used continuous flow isotope ratio mass spectrometry to estimate $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$. We described isotopic niche width of each species in each condition (i.e. allopatry and sympatry) with the Bayesian estimation of the standard ellipse areas. In allopatry, isotopic niche width and isotopic variation were similar in both species. In sympatry, black howler monkeys had a significantly broader isotopic niche, which was mainly determined by high $\delta^{15}\text{N}$ values, and included the majority of mantled howler monkeys' isotopic niche. The isotopic niche of mantled howler monkeys was not different between sympatry and allopatry. The coexistence of these ecologically similar species is linked to trophic niche adjustments by one species, although the particular features of such adjustments (e.g. dietary, spatial or sensory partitioning) remain to be addressed.

Applications of Play Therapy in the Management of Gorillas (*Gorilla gorilla gorilla*): Behavioural Rehabilitation and Group Welfare

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Barcelona Zoo includes play between keepers and animals as a part of great apes' management operations with the aim of promoting sociability, increasing confidence and generating a social dynamic that predisposes individuals to engage in affiliative behaviours. This human-animal interaction is henceforth referred to as play therapy. In October 2018, a keeper at Barcelona Zoo joined the care team of the Zoo Aquarium in Madrid in order to implement the play therapy in a group of 5 gorillas and assess potential behavioural changes that could be triggered due to that management technique. A 15-day habituation period in which the caregiver accompanied the gorilla team was carried out. Then, 15 play sessions were held on consecutive days (1 session per day with an average duration of 1 hour). The last phase consisted of 15 more days in which play ceased to be present in the gorilla's management. Data was collected throughout the 3 phases twice a day after the play session. Data analysis shows that the implementation of play in the management of gorillas in captivity encourages social dynamics and, therefore, increases the welfare levels of the individuals.

The Barbary Macaque: the History of an Ancient Exploitation

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The Barbary macaque (*Macaca sylvanus*) interacted over millennia with North African native populations and with other civilisations of the Mediterranean Sea. Since antiquity, this species was considered to be prey, a sacred animal and an object of trade. This work, based on historical, artistic and archaeozoological data, aims to review the history of exploitation and resilience of this species, in order to provide useful insights for conservation of the remnant wild populations. Some tribes living in the south of Carthage used to hunt and eat monkeys, as reported by Herodotus. This tradition probably remained a form of local sustenance until the 19th century when these monkeys were still observed in North Tunisia. A different attitude to Barbary macaques was observed in some Algerian territories and in Morocco, where these animals were considered sacred and venerated, as referenced by ancient sources. Since the 9th century BC, signs of Barbary macaque presence were found in other Mediterranean places such as Sardinia and Tuscany as a consequence of Phoenician trade. Later on, Greeks and then Romans imported and used this monkey for both scientific and other purposes, such as entertainment and company. This macaque was even considered part of the “Roman family” by wealthy people, being buried within a families’ tomb enclosure. Much evidence testifies to the presence of macaques throughout the Roman empire until the 6th C. AD. This species continued to be the most appreciated by upper classes and street performers in the Middle Ages and the modern period, reaching every part of Europe.