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Oral Presentations

Plenary Sessions

Chimpanzees, People and the Oil Palm in West Africa: Landscapes of Change and Adapt

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Countries such as Guinea and Sierra Leone are not only home to some of the largest remaining populations of the West African subspecies of chimpanzee, but also host vast numbers of native oil palm (*Elaeis guineensis*) and areas of land sought after for large scale oil palm industrial development. The feral oil palm often acts as a prime resource for both humans and chimpanzees across vast mosaics of fallow areas, cultivated fields, riverine areas, forest fragments and human settlements. Since the majority of chimpanzees in both these countries occur outside protected areas, many populations rely on the feral oil palm, possibly as well as human cultivars, for their subsistence. Such landscapes have, in some cases, sustained human-chimpanzee co-existence for generations; however, more recent, rapid changes in landscape structure and use are posing new challenges and fuelling increased intolerance towards chimpanzees and other wildlife. Much of my research centres on understanding how human and chimpanzee behaviour, perceptions and culture influence their ability to share the same landscape and on assessing the main challenges to people's tolerance towards wildlife. The case of the oil palm illustrates perfectly the complexities of co-existence and the challenges that lie ahead for biodiversity conservation and development. Variation in how and where chimpanzees use the oil palm reflects both their ecological and cultural adaptation to human-modified landscapes. Chimpanzee communities across West Africa may use the feral oil palm for nesting and/or for feeding purposes, while the oil palm provides humans with numerous products of immense domestic and commercial value. It is essential for

us to understand these patterns of use and evaluate the oil palm's contribution to the persistence of chimpanzees and other wildlife and to local peoples' livelihoods. Such work could help shape sustainable land use management and economic development on both a local and national scale, concurrent with an agenda of co-existence, rather than one risking fuelling intolerance and conflict.

Ensuring a Future for Primates; Creating Strategies for Coexistence

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Primates, like most other groups of species, are currently threatened by anthropogenic habitat change, by hunting and other activities (trade, removal of 'pests'), and will be increasingly affected by climate change which affects habitat resilience. Each region supporting primates and their habitats faces unique threats, and therefore strategies for coexistence need to be local and evolve in response to specific threats. Specific examples of successful strategies for ensuring the continued existence of primates are discussed – the muriqui (*Brachyteles*) of the relict Brazilian Atlantic Forest, black and white colobus (*Colobus angolensis*) of the highland forests of Kenya, and snub-nosed monkeys (*Rhinopithecus*) in China. These are contrasted with some of the potential extinctions under different scenarios – disease (western chimpanzees and gorillas), climate change (Hoolock's gibbon), deforestation (Malagasy lemurs), and globally traded commodities (orangutans and palm oil). Understanding the socio-ecological drivers of threats, the behavioural contexts of direct hostility (crop-raiding), those places and times when primates can find opportunities for survival, and when human actions specifically create the context for coexistence may shed light on where we can develop and implement strategies so that primates and humans share a future together.

Are Apes Persons? Demanding Legal Rights for Our Next of Kin

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Primatological research is becoming increasingly entwined with ethical discourses such as those related to nature conservation or animal rights. A prime example is the *Great Ape Project* (GAP), initiated in 1993 by philosophers Peter Singer and Paola Cavalieri. It demands that some of the privileges currently reserved for human beings are extended to orangutans, gorillas, bonobos and chimpanzees: the right to life, individual liberty and the prohibition of torture. Protagonists of the project would also like to see great apes recognized as *persons*, given their complex mental landscapes. To stimulate further discussion, particularly in German-speaking countries, GAP was relaunched in 2011 by the Giordano-Bruno-Foundation (www.giordano-bruno-foundation.com; <http://greatapeproject.de>), a secular think tank that promotes the idea of *evolutionary humanism*. Non-human personhood has since become a mainstay of political debate and public interest. Demanding basic equality for great apes should be seen as a continuation of discourses about who should belong to the *community of equals* – for example, if women should have a right to vote, whether dark-skinned Africans or Australian aborigines are human, or whether gay people can marry. These debates have questioned discriminatory concepts such as

racism, nationalism, sexism or heterosexism – while the GAP understands itself as a pioneering initiative to confront *speciesism*. The talk will address the historical concepts and controversies that shape the GAP.

Oral Sessions

Parks and People: The Costs and Benefits of Protected Areas for Local Livelihoods in Two Protected Areas in Guinea-Bissau (West Africa)

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In Africa, 600 million people have been estimated to rely on forests and woodlands for their livelihoods. There has been a significant amount of research in the academic and policy literatures evaluating the impact of national parks and protected areas upon social and ecological landscapes. This study is one part of a western chimpanzee (*Pan troglodytes verus*) conservation project. By comparing the perspectives of the locals living in two different protected areas – Cantanhez National Park (CNP) and Lagoas de Cufada Natural Park (LCNP) – we present the differences and similarities of these villagers' risk perceptions. By 'risk' we mean potential life events or social contexts perceived as adverse, uncontrollable or uncertain. Three issues were considered: (i) People living in these protected areas are dependent on subsistence farming activities in an impoverished and changing ecosystem; (ii) Some farming activities are now constrained, due to policy restrictions imposed by these parks' authorities; (iii) The establishment of the parks has not been associated with any form of compensation for lost livelihood activities. Data collection comprised qualitative (in-depth interviews and focus groups) and quantitative (survey questionnaires) methods. Results suggest that there is a difference between genders: women expressed more negative perceptions towards protected areas than men. In CNP, the top livelihood risk was identified as famine for both men and women, while in LCNP the top risks mentioned more frequently were health (men) and farming (women). These differences between the two parks might be related to the isolated location of the CNP, which has no roads and where economic activities are totally of a subsistence nature. In contrast, LCNP has a main road that links the protected area with the Guinean capital city, it also has public transportation and is economically more prosperous.

Primate Personality: Preliminary Results of a Comparative Study

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Personality can be conceptualized as an individual's consistent patterns of feelings, thoughts and behaviours (Gosling, 2001). There has been an exponential increase in interest in the topic of personality in primatology. Several of the approaches used in primatology for assessing personality are derived from human psychology. The five factor model (a factorial approach) frequently used for assessing personality in the great apes, and subjective scales built using either etic or emic perspectives, all of which pre-structure observations, are currently very much in use. In the authors' opinion, these approaches have limitations. As Murray (2011) mentioned, there is a need to closely relate personality 'traits' with actual behaviours. Clarifying these relations would allow understanding and establishing correlations between specific behaviours, and traits and factors, in different species – ultimately facilitating cross-species comparisons. In the current project we pursue Murray's proposal to begin by observing actual behaviour and identifying patterns. The species selected include one strepsirrhine (*Varecia rubra*) and several anthropoids from both the New World (*Sapjús apella* and *Saimiri boliviensis*) and the Old World (*Hylobates lar*) in order to have a wide phylogenetic representation. These species had either no personality studies reported up until 2014 or only one or two at the most. The observations were conducted at Lagos' Zoo (Algarve) and at Maia's Zoo (Porto) and consisted of direct observations organized by adapted ethograms of each species. The preliminary data that will be presented will include a descriptive and comparative analysis of the observed behaviours of the different individuals of each species, underlining the significant differences found. The results of an interspecies comparison will be presented, although in a preliminary way. The implications for the study of personality in primates will be discussed.

Individual Differences in Stress Coping Strategies in Captive Capuchin Monkeys (*Sapajus* spp.)

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In the study of animal behaviour, analyses are revealing multimodal distributions in which different behavioural strategies can be distinguished within the same species or population. Studies on welfare and management of captive animals are showing that individuals differ in susceptibility to pathologies, resilience and disease progression. The term 'coping styles' refers to the way individuals react and adapt to a stressful environment and two major strategies are described: proactive and reactive. In this work we explore individual differences in the exhibition of Behaviours Potentially Indicative of Stress (BPIS) (e.g. pacing, head-twirl) of captive capuchin monkeys (*Sapajus* spp.). We studied 26 individuals: 6 *Sapajus libidinosus* maintained in 24 m³ non-enriched enclosures (CETAS, Natal – RN – Brazil), 7 *S. flavius* maintained in enriched enclosures of approximately 120 m³ (Salvador Zoo – BA – Brazil) and 13 *S. xanthosternos* held in an enriched enclosure of approximately 120 m³ and on an island of approximately 100 m² (Salvador Zoo). Every 10 s, during 10 min of focal animal sampling, we recorded the behaviours according to an

ethogram of 9 macro-behavioural categories and 10 BPIS. We explored four types of analyses: Activity budget, Diversity indexes, Markov chains and Sequence analyses. We classified individuals as Bold/Shy according to their standardized z-score, in three axes of exploratory related behaviours. The analyses were then compared across classifications. Results pointed to differences between Bold/Shy individuals: Bold individuals showed higher levels of pacing, self-directed and active BPIS while Shy individuals showed higher diversity of BPIS and a high probability of sequences containing BPIS. Overall, the results are suggestive of two broad stress coping strategies, similar to the Bold/Proactive, in which some individuals react by trying to change or escape from the environment and others by hiding.

Cumulative Cultural Evolution and Ratchet Effect in Non-Human Animals: An Objection to Tomasello

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Michael Tomasello considers that, although all animals are the (unfinished) result of biological evolution and that the use of tools is latent in the case of many non-human animals (thus being an indication of culture), only human evolution manifests cumulative cultural effects, which he refers to as a cultural ratchet. The ratchet effect is seen in the progressive history of innovative improvements in the artefacts created over the evolutionary record. Contrary to that view, we consider that some recent investigations reaffirm greater animal-human continuity even in this latter respect since cases of accumulative cultural knowledge have been detected in certain non-human animals. Boesch proposes some chimpanzee behavioural patterns that he believes show the hallmarks of cumulative modifications. The first is nut-cracking behaviour, displayed by different populations across Africa. In particular, western populations use tools, such as hammer stones, to crack nuts, and Boesch believes this is an elaboration of an ancestral behaviour pattern of hitting nuts on the substratum to smash them. This behaviour pattern has, according to Boesch, been further modified with the use of anvil stones and, in some cases, a second, stabilising stone. The second behaviour pattern outlined as cumulative by Boesch is ectoparasite manipulation in the three eastern chimpanzee communities of Budongo, Mahale and Gombe. At all three sites, leaves are used to inspect the parasites that have been removed during grooming; at Budongo the parasite is placed on a leaf when removed. However, at Mahale individuals fold the leaf and then cut it with their nail. At Gombe there is a variant in which several leaves are piled on top of one another before the parasite is placed on the top and inspected.

Use of Natural Resources by Sanctuary Chimpanzees (*Pan troglodytes*): Understanding the Significance of Naturalistic Enclosures

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Captive environments are extremely simplified versions of the complex ecosystems where wild non-human primates (NHP) live. These environments lack cognitive and behavioural challenges, compromising animal welfare and leading to abnormal behaviours. Naturalistic environ-

ments have been promoted as a way to enhance species-typical behaviours and the welfare of captive NHP. The aim of this study was to evaluate the exploitation of a naturalistic enclosure by two groups of sanctuary chimpanzees as a way to understand the usefulness of this kind of setting to fulfil the animals' needs. We used multifocal scan sampling to record the activity budget, and multifocal all occurrence sampling to record interactions with the environment (vegetation and natural substrate) and the local fauna. We collected 133 h of behavioural data during 4 months. We fitted zero-altered negative binomial (ZANB) mixed models to explain interactions with the environment, which were grouped in 3 sets of behaviours: feeding, manipulation and tool use. Our results show that feeding on vegetation increased during the afternoon, corresponding with the time when less food was provided. Manipulation was positively correlated with number of years living at the sanctuary, although the origin of the individuals also affected this behaviour, with captive-born chimpanzees spending less time in manipulative interactions with the environment. Tool use was enhanced by the provision of environmental enrichment, but it was also affected by the origin of the individuals, increasing for captive-born chimpanzees. Regarding interspecific interactions, there were 7 episodes recorded between chimpanzees and local fauna. This study highlights the significance of naturalistic enclosures in the emergence of species-typical behaviours, as well as the importance of natural vegetation for the provision of a continuous source of food. However, it also highlights that a better knowledge of the individual's past history can help to understand individual processes of recovery and rehabilitation better.

Local Knowledge of the Red-Handed Howler Monkey (*Alouatta belzebul*) and Perception of 'Guariba' Biological Reserve by the 'Caiana' Community in Paraiba, Northeast of Brazil

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The 'Guariba' Biological Reserve was created in 1990 in Paraíba-Brazil and got its name from the *Alouatta belzebul* population that was locally extinct. The area was repopulated with this species and it was selected as a flagship species. The 'Caiana' human community is situated around the reserve's boundary. In order to assess their relationship with the *Alouatta belzebul* population and to understand local perceptions about the reserve, we conducted in-depth interviews (N = 23: women = 18 and men = 5). Topics such as community daily activities, *Alouatta belzebul* habitats and diet, and perceptions about the reserve were explored (among other topics). The studied community is a rural one and there is a primary school, an evangelical church and a health worker monitoring family health. Interviewees' ages ranged from 17 to 78 years (most of them with elementary education). Residency within the community ranged from 2 to 53 years and families varied in size (from 1 to 8 members). Agricultural tasks (crops of corn, sweet potatoes, papaya and cassava) were mainly performed by men while women performed household activities. Only one respondent knew the origin of the reserve's name. Respondents knew that *Alouatta belzebul* had been introduced after the reserve's creation. Most respondents answered that the diet of *Alouatta belzebul* consisted of leaves and fruits. All of those who had seen howler monkeys and/or listened to their vocalizations mentioned the reserve as the place where animals live and are seen (Fisher test $p = 0.002$), and that the *Alouatta belzebul* population had increased (Fisher test $p = 0.005$) as a result of hunting rules that forbid hunting or trapping. Thus, the reserve was seen as monitored area. Conservation strategies will be implemented via environmental awareness.

Hand Preference and Reaching Task Performance in Common Marmosets (*Callithrix jacchus*)

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Lateralization has been widely studied in common marmosets (*Callithrix jacchus*), and other primates, in relation to evolution, hemispheric dominance and even behavioural style. Primates are more likely to express hand preference on complex tasks and, recently, it has been demonstrated that the strength of lateralized behaviour, rather than its direction, can predict a better performance in certain dual tasks. The aim of this study is to measure hand preference (using both its direction and its strength) and success rate using a complex task involving visuospatial reaching and postural demands. We used 16 captive-born adult common marmosets from 3 different family groups, 11 males and 5 females from Universidad Autónoma de Madrid. To test hand preference in a demanding task, we used a transparent cylinder measuring 12 cm with a 3-cm diameter that contained pieces of food, the cylinder was hung from a horizontal branch using a string. A total minimum of 40 successful attempts per animal were recorded during the experiment. We found no population level preference ($p = 0.501$; Wilcoxon test). Fourteen of the 16 animals showed a strong preference for one hand over the other, with a z score well above 1.96 in absolute value, 8 of them had a preference for the right hand and 6 for the left hand. We found no connection between the direction of hand preference and success in the task, but there was a correlation ($R = 0.583$) between strength and success rate. Hence, our results support the theory that strength of lateralization (and not the direction) appears to be associated with the ability to carry out complex tasks.

The Effect of Cognitive Enrichment on the Welfare of Sanctuary-Housed Chimpanzees (*Pan troglodytes*)

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The increase in the pet and bush meat trade and continued habitat loss have jeopardised the conservation status of many primate species. These growing pressures have led to an increase in the number of animals in sanctuaries and rescue centres, which need to maintain levels of welfare of the primates they house. Fundació Mona (Spain) is one such sanctuary, housing 13 chimpanzee, 9 males and 4 females. We tested the effectiveness of a cognitive enrichment regime implemented over a four month period on the welfare of 8 socially housed chimpanzees (*Pan troglodytes*). Animals were presented with puzzle boxes containing food rewards. Interaction with the devices was recorded and focal behavioural observations were conducted. Positive and negative behaviours were recorded, which were further categorized into social and individual behaviours. The chimpanzees did interact with the enrichment, though not all were successful in completing the task. We found no significant effects of cognitive devices on any of the behavioural measures recorded. We discuss these findings in terms of the need to evaluate the effectiveness of enrichment interventions. If such enrichments do not benefit the welfare of chimpanzees in sanctuary environments, facilities should focus their efforts and funding on other forms of enrichment or rehabilitation to improve standards of welfare.

Relation of Collecting Non-Timber Forest Products with Hunting of Bushmeat in the Cross River National Park

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The present project addresses in what way granting access to human communities to collect non-timber forest products (NTFPs) may be linked to increase in hunting activity in the Cross River National Park (CRNP), Nigeria. The CRNP is home to the critically endangered Cross River Gorilla (*Gorilla gorilla diehli*) with an estimated total population of fewer than 300 individuals, and it's also home to other endangered primates. The Park consists of two separate divisions: Oban and Okwangwo. The Okwangwo Division, covering an area of about 640 km², was established from an amalgamation of four former forest reserves with elevations ranging from 150 m to around 1,700 m. A major unresolved problem is the presence of three large enclaved villages within the park. The expansion of village farmlands outside of their enclave boundaries threatens to bisect the forests of the Okwangwo Division and further isolate the gorilla sub-populations, in addition to increasing hunting pressure. The collection of NTFPs and the hunting of bushmeat is an important livelihood for more than 80% of the nearby population. For many years, refusal to grant permission to communities to seasonally harvest certain NTFPs (especially *Irvingia gabonensis*) within and around CRNP has resulted in tensions between the Park and people. Recently, the Park authorities started to consider granting permission to communities to collect these products seasonally, on the understanding that there would be no hunting during collection. The most recent data suggest that there might be some relationship between *Irvingia* collection and hunting within the Park. It would be interesting to see how granting access to NTFPs within a protected area at certain times as a management strategy in the face of increasing pressure from local communities might impact on conservation. This presentation will describe a research project that is about to start in one of the most important gorilla conservation areas.

Space Use Is Related to Welfare in Rehabilitated Chimpanzees

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Several behavioural and physiological measures have been used to obtain objective measures of animal welfare. Nevertheless, few studies have attempted to obtain empirical measures of space use within the captive environment as an animal welfare indicator. Regarding primate rescue centres, the trend toward naturalistic enclosures provide an improved environment to obtain a positive level of welfare. One of the main consequences of social isolation and abuse in non-human primates is the development of behavioural abnormalities and a lack of social skills. Some authors have also found an alteration in their spatial behaviour evidenced in agoraphobia or spatial isolation from other group members. Our objective has been to quantify the relationship between spatial behaviour and welfare in a sample of rehabilitated chimpanzees at Fundació Mona (Girona, Spain). The sample was composed of 18 chimpanzees (*Pan troglodytes*). Data were collected over nine years (2007 to 2015). Behavioural (n = 20) and spatial data were recorded using a scan sampling technique. We measured: (1) spatial welfare indicators: weighted exploration index, core activity field and isolation field index; and (2) behavioural welfare indicators: behav-

journal competence and social competence indices. Our results show: (1) a significant correlation between behavioural and spatial welfare indices over time; (2) changes over the years in spatial welfare indicators; and, (3) individual characteristics (origin, background, age at onset of rehabilitation) influence whether the chimpanzees behave in a spatial context. We conclude that including spatial information is useful for understanding how captive primates increase their welfare and interact with their environments, thereby improving the set of objective measures of animal welfare.

Development of Social Networks of Ex-Pet and Ex-Performer Chimpanzees: A 10-Year Long-Term Study at Fundació MONA

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Primates are intelligent and sociable animals. Unfortunately, they are used in circuses, advertisements, films or as pets. The consequences of these abusive and deprived situations are a lack of important skills for living in a primate group environment. One of the main objectives of primate rescue centres is creating groups to socialize rescued primates. Our purpose has been to apply social network analysis (SNA) techniques to explore the social structure and relationships of ex-pet and ex-performer rescued chimpanzees. We monitored a group of 18 chimpanzees (*Pan troglodytes*) housed at Fundació Mona for 10 years. Our main goal has been to quantify their social networks to assess the socialization process over the years. We used a scan sampling technique to record all social interactions. We calculated social interaction matrices and two social network indices: centrality degree (the number of direct relationships); and eigenvector (central individuals in terms of the global structure of the network). A social proactivity index and a social competence index were also calculated. Our results show that social networks become more solid and stable over time and that the roles each individual plays in the network has an influence inside his/her group. The positions of each node can differ within the social network according to the requirements which the individuals and the context demand. The origin (wild *versus* captive born) had an influence within social networks. Captive-born chimpanzees had an increased ability to develop social skills within social networks in comparison with wild-born. Larger groups and mixed-sex groups improved the social network dynamics. Social proactivity was not related to any individual characteristics. Nevertheless, social competence increases over time. We conclude that SNA is a suitable technique to evaluate the resocialization processes of socially isolated chimpanzees and their social skills, and that network complexity improves over time.

Education as a Strategy to Reduce the Negative Impact of Visitors on the Barcelona Zoo Primates

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Over the last decades, zoos have undergone a transformation: having evolved from obsolete models built exclusively to put animals on display, nowadays exhibits are designed to contribute to the conservation of species and visitors' education. The mission of Barcelona Zoo states that it

is necessary to 'undertake decisive actions in the fields of both education and entertainment in order to raise awareness about respect for species'. However, we have to consider if people that visit the zoo behave correctly with the animals. During the visit, visitors are exposed to presentations giving behavioural rules. In addition, these rules are shared with visitors through loudspeakers. Nevertheless, it is very common to observe visitors behaving inappropriately, which affects the animals' physical and psychological health. In the present study we created a leaflet in order to educate visitors, but we also look at the impact of stress reduction in white-naped mangabeys (*Cercocebus atys lunulatus*) and Barbary macaques (*Macaca sylvanus*). This brochure, by using text, symbols and drawings, presents four rules to the visitors: don't shout, don't use flash, don't bang on the glass and don't give food or objects to the animals. To test the effectiveness of this resource, a study was designed consisting of three phases. First, in the baseline stage, inappropriate behaviours of visitors and stress behaviours of primates were recorded without presenting the leaflet. Second, during the treatment stage, behaviours were collected while providing the brochure to the public. Third, in the post-treatment baseline, behavioural data collection continued after leaflet presentation stopped. During the treatment phase, 2041 leaflets were provided to visitors. Furthermore, 58.5 h of observation were conducted on non-human primates and 58.5 h on the public. Comparisons between phases showed that the presentation of this resource significantly reduced inappropriate behaviours of visitors and the stress signals in both species.

Saving the White-Naped Mangabey and the Roloway Monkey in Ghana

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Deforestation, habitat fragmentation and illegal hunting are leading to the extinction of the white-naped mangabey (*Cercocebus atys lunulatus*) and the roloway monkey (*Cercopithecus diana roloway*). Both species, which occur in Ghana and Côte d'Ivoire, have been included several times in IUCN's list of the World's 25 Most Endangered Primates as a result of their wild populations being reduced by more than a 50% in the last decades. In 2001, to promote in situ and ex situ conservation of these and other species of primates, the West African Primate Conservation Action (WAPCA) was established. This association between 16 European zoos, in partnership with the Wildlife Division of the Forestry Commission of Ghana (Ghanaian government), is working in the Kwabre Forest, Ghana, conducting surveys to find new primate groups, monitoring known groups, reforesting to create natural corridors between Ghana and Côte d'Ivoire, and educating local communities, among other tasks. Regarding *ex situ* management, in 2005 WAPCA built the Endangered Primate Breeding Centre (EPBC), located in the Achimota Forest in Accra, with the aim of housing and rehabilitating individuals of these species. The EPBC has now 14 mangabeys and one pair of roloway monkeys, which are part of their corresponding European Breeding Programme for Endangered Species (EEP) to enhance the genetic variability of captive populations. Apart from the EPBC enclosures, WAPCA is constructing an enclosure to house a semi-free reproductive group of mangabeys. This space will allow us to compare the other reproductive group living at the EPBC with the semi-free group, assess the behavioural changes that may appear in the semi-free group and learn about adaptation capacity and rehabilitation in mangabeys, with a view to a possible reintroduction once the habitat is safe.

Genetic Consequences of Human Forest Exploitation in Two Colobus Monkeys in Guinea Bissau

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The ability of forest-dwelling species to adapt to changes in their habitat is being increasingly challenged by the rapid pace of human-induced forest degradation. Understanding the effect of such environmental changes on biodiversity requires comparative analyses across species living within the same habitats. We investigated the effect of forest exploitation on the genetic structure and demography of two sympatric arboreal primates showing differences in their socio-ecological plasticity: the western black-and-white colobus (*Colobus polykomos*) and Temminck's red colobus (*Procolobus badius temminckii*). We conducted the study in a fragmented and human-impacted forest in Guinea Bissau. Using microsatellite data from six *C. polykomos* and eight *P. b. temminckii* social groups, we found that in *C. polykomos* the distribution of genetic diversity followed an isolation-by-distance pattern whereas for *P. b. temminckii*, the results suggested restriction in female dispersal. We detected a strong, recent bottleneck for both primates, which we inferred to have resulted from the anthropogenic exploitation of forest resources in the last centuries. The bottleneck signal was stronger for *P. b. temminckii* as a likely consequence of its larger estimated ancestral population size. Finally, we discussed the different analytical approaches used and the effect of the kin structure biasing the results. Our results confirm that *P. b. temminckii* is less plastic and more affected by habitat changes than *C. polykomos*, despite being phylogenetically close. Nonetheless, the low estimated effective population sizes and the known demographic changes indicate that both species are severely threatened by human forest exploitation, requiring urgent conservation action.

Social Structure Matters: On Some Genetic Consequences of Mating Systems, Dispersal and Sampling

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In nature, many species are socially organised and populations often consist of small age-structured units where a limited number of individuals monopolise reproduction and exhibit complex mating strategies. However, despite its ubiquity, social structure is usually ignored in most population genetics models. We developed a new individual-based simulation framework to simulate genetic and demographic data under some of the most common mating strategies found in primate species. We model populations as networks of social groups among which individuals from one or both sexes can disperse. Our results show that socially structured populations are expected to show high levels of genotypic diversity in the form of outbreeding, even though we do not model explicit inbreeding avoidance behaviours. Moreover, sampling strate-

gies are the key to detecting these outbreeding signatures. When only reproductive individuals are sampled, spurious signals of random-mating are found. Importantly, our simulations suggest that sociality maximizes diversity in relation to what theory predicts for random-mating populations, which contradicts the belief that social groups are necessarily subject to strong genetic drift and at high risk of inbreeding depression. This new framework may thus represent a valuable tool to give insights about the genetic consequences of social structure and provide a null model against which inbreeding avoidance, tolerance or preference theories can be tested.

Use of Plants by Captive Chimpanzees (*Pan troglodytes*) in a Naturalistic Environment

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Naturalistic enclosures have been proved to induce species-typical behaviours in captive primates, which are an optimal predictor of their physical and psychological health. However, little information exists about captive chimpanzees' foraging behaviour and diet composition. The study goals are a deeper perception of how chimpanzees exploit the natural vegetation available and the collection of detailed information about the plants they interact with. These highlight the importance of naturalistic enclosures to the individuals' welfare and increase knowledge about the type of vegetation that best fits their biological needs. A three months study with 13 chimpanzees took place at Fundació Mona, a rescue centre in Girona, Spain. The interactions between plants and chimpanzees, as well as plant species information, were recorded using two different methods of observation: focal continuous sampling (N = 413) and multifocal scan sampling (N = 413). The results, employing the first method, have shown that chimpanzees consumed vegetation for 8.4% of their time, which corresponded to 6.3% using the second method. They selected mostly *Poaceae* and *Asteraceae* families and about 50% of the consumed species are *Potentilla reptans*, *Convolvulus arvensis*, *Taraxacum officinale* and *Aster pilosus*. The main plant parts eaten are leaves, followed by stems and roots. Manipulation takes 2.2 and 5.4% of the observation time, according to focal and multifocal methods, respectively; woody plants were the most commonly employed as tools. Individual preferences for specific plants are evident and age is an influencing variable in the way chimpanzees' feed on natural vegetation. In conclusion, interactions with natural vegetation are a significant portion of chimpanzees' daily activities, which emphasises the importance of having access to new environmental opportunities provided by naturalistic enclosures. The study includes real values of the time spent on these activities as well as the species utilized; thereby being a useful tool to improve current situations of captive chimpanzees.

Consequences of Social Deprivation and Humanization on Chimpanzee (*Pan troglodytes*) Communication

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Chimpanzees are highly social animals and close contact with their conspecifics is crucial for the normal development of their cognitive abilities. Numerous studies have shown short- and long-term effects of social deprivation at a physical and psychological level. However, only a few studies report the consequences of these processes in communication. Therefore, the goal of this study is to determine how some factors of social deprivation and humanization, in particular their origin, their background, the previous presence of conspecifics and the time of rehabilitation, affect chimpanzees' communication at Fundació Mona. During 685 h, we recorded the communicative behaviours of the 13 chimpanzees living in the sanctuary, which have suffered serious social deprivation processes in humanized environments. Three of the 13 individuals were born in the wild, and 5 of them have worked in the entertainment industry. In total, 4 chimpanzees had never been in contact with conspecifics prior to the rehabilitation process. Individuals who were born in the wild had a higher frequency of some agonistic behaviours; those who had lived with conspecifics used a greater variability of contexts; and those who had never had previous contact with their own species had a higher frequency of communicative inactivity. Our results indicate that, though certain factors of social deprivation and humanization which affect some communicative behaviours exist, we cannot infer that these processes affect the general communication of the individuals hosted at Fundació Mona. Since the last chimpanzee was introduced three years ago, we can assume that his rehabilitation and re-socialization could have played an important role in decreasing the communicative differences among these chimpanzees.

Assessing Acoustical Preferences of Chimpanzees

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Evidence suggests that correct auditory stimulation can be a powerful method to enhance the welfare of captive animals. However, sensorial enrichment studies have provided little evidence regarding acoustic preferences. The purpose of this study is to determine the spontaneous preferences for different values of frequency, tempo and amplitude of 13 sanctuary chimpanzees (*Pan troglodytes*) housed in two groups. The two groups differed in their social stability: Group 1 was a stable group with old bonds (last introduction was in 2011) and Group 2 hosted all new rescued individuals (last introduction was in 2014). A basic acoustic stimulus was manipulated, resulting in 4 audio treatments, two with opposite values of tempo and two with opposite values of frequency. We created an influence zone in both outdoor enclosures where the audio stimulus could be perceived from a range of 40–80 dB, resulting in 4 concentric zones (with a difference of 10 dB between each) radiating from the two speakers. A subject's time spent in each zone was recorded continually (before, during and after the treatment), as a measure of preference. Although our findings suggest that chimpanzees were capable of discriminating different values of

tempo, frequency and amplitude, we could not determine a general preference range of frequency or tempo for our sample. While one group showed a significant preference for low frequency, the other showed a trend for high frequency. Similarly, one group displayed a significant preference for fast tempo, whereas the other showed a trend in the opposite treatment. Regarding the amplitude, the closest zone to the acoustic stimulus (70–80 dB) was the most used for all treatments. These results suggest that preferences in chimpanzees may not be unique. In addition, an intrinsic factor, such as social condition and emotional state, could be a possible variable that influences their preference.

Nine Years of Primate Conservation Genetics in Guinea-Bissau and Prospects for Future Conservation

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Primate conservation genetics can be defined as the study of genetic patterns and evolutionary processes to improve long-term conservation plans. Guinea-Bissau, a small Western African country, is considered a regional hotspot in biodiversity. Primary forests in the country have been recognized as relevant for worldwide biodiversity conservation. Ten primate species are present, of which the endangered western chimpanzee (*Pan troglodytes verus*) is the national flagship for tropical forest conservation. However, habitat destruction and illegal hunting became powerful forces driving the decline of Guinea Bissau primates. Increasingly higher levels of anthropogenic threat attracted the attention of conservation geneticists. For the last nine years, the genetic patterns of *P. troglodytes verus*, *Colobus polykomos*, *Ptilocolobus temminckii*, *Papio papio* and *Cerco-pithecus petaurista* have been studied using non-invasively collected samples and fast and slow evolving genetic markers. We reviewed the conservation genetic studies on Guinea-Bissau primates to detect common genetic consequences of anthropogenic activities and identify future conservation needs. Estimated levels of genetic diversity were not particularly low but the studied primates display signs of recently altered population structure and dispersal patterns, with consequences for social group dynamics. Presence of human activities (e.g. hunting) and habitat fragmentation were suggested as the most probable explanations for disrupted dispersal behaviours. Urban primate bushmeat trade was documented and estimated for the first time using molecular identification of carcasses. Results suggest a minimum of 1,550 carcasses sold per dry season of six of the ten Guinea-Bissau primates. Our review suggests that protecting the natural habitat and controlling illegal hunting is necessary to maintain connectivity of the populations and the long-term persistence of primate species in Guinea-Bissau. This project is funded by Portuguese Foundation for Science and Technology (SFRH/BPD/88496/2012 and SFRH/BPD/87396/2012), Born Free Foundation and Chester Zoo.

Dispersal in the Desert: Genetic Diversity and Population Structure of the Guinea Baboon (*Papio papio*) in Mauritania

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Dispersal is an important evolutionary force impacting a species' spatial structure and global persistence. Dispersal strategies are frequently sex-biased in mammal species with polygamous or promiscuous mating systems. Although males usually disperse at higher rates than females, the reverse pattern has been identified for several species, including the Guinea baboon (*Papio papio*). Guinea baboons occupy a small distribution area in West Africa and have been mostly studied in Senegal and Guinea-Bissau. Molecular data point to female dispersal and male philopatry in Senegal and historical female-biased dispersal pattern over the entire range. However, intra-specific variation in the extent and direction of sex-biased dispersal was found in Guinea-Bissau, where gene flow was mediated through both sexes. This study aims at investigating the dispersal strategies of Guinea baboons in Mauritania using non-invasive faecal samples and contributing to the conservation of these populations. In Mauritania, the populations are restricted to the southern mountains and, considering the large distance between suitable areas for baboons, it is expected that there will be some degree of isolation between the populations of the mountains and between these populations and the ones in the core area of the species' range. Results obtained from the analysis and comparison of both markers suggest that the Mauritanian populations have similar levels of genetic diversity as the populations of other countries. There is no evidence of strong mitochondrial spatial structure, indicating a historical female-biased dispersal.

The Iberian Contribution to Non-Human Primate Natural History in the Age of Discovery

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As a centre of overseas expeditions undertaken during the 15th and 16th centuries, the Iberian Peninsula, within the kingdoms of Spain and Portugal, played a major role in descriptions and chronicles of the animals and plants encountered in the recently discovered lands, namely sub-Saharan Africa, Central and South America and India. Explorers, soldiers, historians and religious men left us a complex framework of the natural world of those lands. This new body of knowledge, based largely on empirical reports full of details and first-hand observations, emerged as the first nucleus of the natural history of many primate species, though it is still scarcely considered in the history of primatology. The Portuguese and Spanish also became major importers of natural resources from these lands and, among the rich variety of natural goods and animals, non-human primates were imported in great quantity to be sold and distributed all over Europe. Our research documented that more than 20 different taxa of primates from Africa and South America reached Europe alive. Their presence at noble and wealthy residences is traceable in the European artistic, cultural and naturalistic productions of that time. The present work will give a summary of the Iberian contribution to non-human primate knowledge in early modern times, pointing out: (a) the most important characteristics highlighted in the 16th century literary sources of Spain and Portugal; (b) the taxa described and their ethnotaxonomy; (c) the species imported and their main trade routes.

Poster Presentations

The Chimpanzees (*Pan troglodytes*) of the Lisbon's Zoo: A Study on Their Social Behaviour

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Studies on chimpanzee social behaviour highlighted a separation of roles among males and females. In turn, whereas play is always present in young, in adults and juveniles some variations could be observed. The goal of this study is to describe how gender and age may influence social interactions in a chimpanzee colony. The study was carried out at the Lisbon Zoo during 12 months. Fifteen individuals (aged from 4 months to 20 years) were in the group: seven adults (two males and five females), one sub-adult female, three juvenile females and four infants. Quantitative data were collected using the 15-min focal sampling method (300 min collected for each individual). Results were analysed using non-parametric statistics tests. Adult females showed affiliative and play (social and solitary) behaviours more than males, although there were no significant differences (Mann Whitney test, $p > 0.05$). Affiliative behaviours were more common in adults than in young or juveniles ($p < 0.01$), whereas play in juveniles of both sexes occurred more frequently than in adult chimpanzees (20% of the records). Agonistic interactions among adults were rare, but there were significant differences between sexes, with males being more aggressive (Mann-Whitney test, $p < 0.01$). Older chimpanzees of both sexes showed more aggressive behaviour (72% of the records) than younger chimpanzees (28%). Our results confirmed the behavioural patterns found in other studies. The rare agonistic behaviours observed might be correlated with the high number of females and to the already established and clear leadership of the group by one of the two adult males.

Stereotypical Behaviours in a Captive Lowland Gorilla (*Gorilla gorilla gorilla*) Social Group

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The present work analyses the presence of stereotypical behaviours in a colony of gorillas (4 individuals, of which just one female was wild born) living at Lisbon Zoo. Data were collected during 2009 using a combination of focal samples of 15 min ($n = 40$ collected for each individual, $n = 160$ for the entire group), and ad libitum observations. The results were analysed using non-parametric statistics. We observed $n = 78$ stereotypical behaviours (regurgitation and re-ingestion (R/R), coprophagy, stereotypical patterns, stereotyped body movements). The stereotyped body movements were the most recorded ($n = 37$; 47.4% of the total record). These behaviours were observed in only the females of the group, whereas the silverback, introduced last into the group from a European zoo, never showed such behaviours. Backi, a female raised in a circus,

showed the major percentage of ‘abnormal behaviour’ (60.2% of the total sample, corresponding to 3.45% of the total observation records) whereas Anguka and Ulka showed a lower percentage, respectively 29.4 and 10.2%. The Mann-Whitney test showed significant differences ($p < 0.01$) among females for all kinds of stereotypical behaviours considered. Our results confirm that the personal history of each individual had a large influence on abnormal behaviours. In addition, the ranking position in the group could have an influence. Comparing our study with the previous ones carried out in the same colony (see Casanova, 1992 and Caeiro, 2008), we observed a lower percentage of stereotyped behaviours, probably due to a few modifications made in the colony’s facility. Nevertheless our results showed a higher rate of stereotyped behaviours than other similar studies, as well as a higher inactivity rate in the colony. This means that the enclosure occupied by the gorillas requires a more extensive enrichment plan.

Stress in Captive *Macaca sylvanus*: The Effect of the Presence of Chimpanzees and Humans

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Animals housed in artificial habitats are confronted by a wide range of potentially provocative environmental challenges that do not exist in wild environments. In zoos and sanctuaries, an important challenge to animals’ welfare is the forced proximity to other species. The objective of this study was to evaluate the effect that humans and chimpanzees had on the welfare of a group of *Macaca sylvanus* housed at Fundació Mona. We compared the macaques’ behaviours in the presence and absence of visitors and chimpanzees. In addition, we placed different visual barriers which limited the monkeys’ view of caregivers and chimpanzees and we compared behavioural changes with barriers and without them. Also, we assessed the effect of the enrichment. Our results showed that in the presence of visitors, the dominance, locomotion and behaviours towards humans increased. In the presence of chimpanzees, social interactions, interactions with humans and inactivity increased; while the behavioural competence index (BCI) decreased. Moreover, when visual barriers were used, abnormal behaviours, dominance and human interactions increased. And finally, when enrichment was done, the abnormal behaviours, manipulative activities, vocalizations and the behavioural competence index increased. We can conclude that controlled, guided visits have a neutral effect on the Barbary macaque’s welfare. On the other hand, the presence of chimpanzees has a negative effect on the macaques’ welfare. According to our results, using visual barriers to limit the sight of caregivers or chimpanzees had a short-term negative effect on the macaques’ welfare. Finally, using environmental enrichment has a positive effect on the macaques’ welfare.

Are Social Contexts Influencing Sociozoologic Scales? Analysis of a Sample in Lisbon

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Social perceptions of the animal kingdom are symbolically organized into good and bad animals. While phylogeny classifies animals according to biological features and affinities, the sociozoologic scale organizes species as a function of their perceived or actual roles in local societies. Good animals have a high moral status due to their subordinate roles. These are perceived as accepting their status and reinforce the concept that humans are the pinnacle of the animal kingdom. In Western societies, companion animals, livestock, laboratory and anthropomorphised animals are examples of non-humans perceived as decent citizens. On the other hand, bad animals are viewed as uncontrolled/uncontrollable creatures potentially capable of subverting the sociozoologic scale. Using Arluke and Sanders' model (1996) as a basis, I establish a preference ranking to determine which species people like and dislike and assess the factors which underlie these preferences. We have been conducting a survey-questionnaire (n = 300) since September 2015 in three different scenarios: Lisbon Zoo (n = 100), Lisbon Oceanarium (n = 100), and Colombo Shopping Centre (n = 100) that will work as a 'control sample'. We do not expect to find significant differences between the visitors' or shoppers' perceptions irrespective of where the survey questionnaires took place, which might indicate that conservation messages displayed in Lisbon Zoo and Lisbon Oceanarium are not efficient at raising awareness about the need for wildlife protection. However, primates, particularly chimpanzees, appear to be perceived slightly more positively by those who were interviewed in Lisbon Zoo, suggesting that being able to experience these animals – sight and sounds – can play a role, at least temporarily, in modifying subjects' perceptions. In general, primates were described as ugly and similar to humans.

Can Chimpanzees' (*Pan troglodytes*) Faces Determine Their Personality?

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We define personality as the inter-individual differences in behaviour which are stable in time and contexts. The main aim of our study was to validate a new method to measure personality in captive chimpanzees. We studied 13 chimpanzees (*Pan troglodytes*): four females and nine males at Fundació Mona, Girona (Spain). We aimed to determine if we are able to recognize personality traits, general welfare, gender and age of chimpanzees in facial morphology of unknown chimpanzees. We created the Personality Chimpanzee Faces Questionnaire based on previous studies. We asked 107 volunteers to match a list of 18 adjectives, each quantified from 1 (very low) to 7 (very high), by just looking at two photos of our 13 individuals. We included some adjectives about the health of the individuals because some studies suggest that it is related to facial asymmetry. To evaluate chimpanzee gender and age, we followed the previous model but number 1 was 'very feminine' and 'very young', and number 7 'very masculine' and 'very old'. We com-

pared these results with personality factors of a previous study (Úbeda and Llorente, 2014, e.g.: extraversion, conscientious/agreeableness, dominance, conscientious/ openness), but the correlation between them was not significant. However, we can confirm that people can guess the age of individuals by seeing a photograph of a face. In conclusion, we can state that the results obtained in this study were not sufficient to ensure that this method is a valid one to assess personality. Nevertheless, we consider it to be an innovative method and conclude that more work is needed.

How to Measure Social Networks? A Comparison of Interval and Continuous Sampling Methods for Chimpanzees (*Pan troglodytes*)

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It is scientifically accepted that chimpanzees (*Pan troglodytes*), like many other primates, are highly social animals. Recently, social network analysis (SNA) has been revealed as an important component of modern field primatology. SNA provides in depth understanding of social structure and dynamics of complex animals. Furthermore, some authors consider SNA to be a valid welfare indicator, both in wild and captive subjects. Nevertheless, there are different sampling methods available to record social data and no consensus exists about the suitability or specific circumstances to be used in SNA. Our purpose has been quantitatively to evaluate differences among two commonly used behavioural sampling methods: multifocal scan sampling (2 min intervals) versus focal animal sampling (20 min continuous sessions). We analysed data from 2013 to 2015 for the two independent sample methods. We calculated the dyadic interaction measures matrices for each year. We also calculated three SNA indices: centrality degree (the number of direct relationships); eigenvector (central individuals in terms of the global structure of the network); and social proactivity index. We used a GLMM to compare the different SNA indices values from the two sampling methods. Our results show that there are no significant differences in SNA analysis between the two sampling methods. This study shows that both continuous focal animal and multifocal scan sampling provide us with similar results during the SNA taking into account a three year database. We conclude that both techniques are suitable for use in social network analysis in long-term studies with captive primates.

Maternal Behaviour of a Muriqui (*Brachyteles hypoxanthus* – Primate – *Atelinae*) when an Offspring Died

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We provide an account of maternal behaviour in the northern muriqui (*Brachyteles hypoxanthus*) after the death of a dependent offspring. The event was observed at the RPPN Feliciano Miguel Abdala, in Minas Gerais, Brazil as part of the Muriqui Project of Caratinga. The study

group is fully habituated to trained observers, who collect behavioural data on a daily basis using focal animal and scan sampling methods. On 27 March 2012, an adult female and her 2-year old daughter were observed feeding in a tree about 10 m from the ground. After 8 min, the female offspring fell from the tree and remained on the ground. At the same time, the mother came down to the ground and stayed vigilant at a distance of 2 m from her offspring. The mother remained in the area for about 3 h. During this time, she vocalized toward her daughter and approached and pulled her hand many times. The female offspring responded to the stimulus sometimes, moved her hand and vocalized, but did not get up to follow her mother. After about 2 ½ hours, part of the group vocalized and started moving away from the area. The mother answered the vocalizations and began to follow the rest of the group. We observed the offspring on the ground for about 3 h after the departure of her mother. When we finally approached the animal we noticed that she had died. This account is an example of the importance of long-term studies, as daily monitoring of primates allows us to observe rare and peculiar situations in their day-to-day lives. Fieldwork was funded by awards to Karen B. Strier from the U.S. National Science Foundation (BCS-0921013), the Graduate School, University of Wisconsin-Madison, and Conservation International, and conducted with permission from CNPq and Preserve Muriqui.

Chimpanzees' Communication: A Descriptive Study at Fundació Mona (Riudellots de la Selva, Girona, Spain)

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Several studies have shown that wild chimpanzees' gestural repertoire is very complex. Chimpanzees' gestures seem to be intentional and flexible, allowing the use of the same gestures in different contexts and the use of different gestures to express the same intention. The captive environment of primate sanctuaries and the individuals' traumatic past might influence the way chimpanzees communicate. Our goal was to describe the gestural and vocal communication of a sample of 13 chimpanzees at Fundació Mona. Gestures and vocalizations emitted by both sender and recipient and the context of their occurrence were examined for an observation period of 685 h. According to our expectations, our results reveal differences in the communicative behaviour of captive chimpanzees compared to wild chimpanzees. In particular, captive chimpanzees showed low communicative variability, multimodality and efficiency. Close to 29% of gestures and vocalizations were directed towards humans, varying the individual frequency between 20–419 gestures. In general, the most common gestures occur in different contexts, but some of these communicative behaviours appeared significantly associated with certain contexts: (1) affiliative context related to look, share space and follow, (2) trophic related to chase, and (3) agonistic context related to bipedism, gallop, jump, swing, avoid, run away and drum body. With regard to vocalizations, pant hoot is associated with affiliative context, hoot with trophic and scream with agonistic context. Nevertheless, the association between certain gestures/vocalizations and the contexts seems to be similar in captivity to what can be observed in the wild. As expected, due to social deprivation and humanization, the chimpanzees of Fundació Mona display a poor communication repertoire and it is mostly directed toward humans.

Social Network Analysis of the Black Howler Monkey (*Alouatta pigra*) in a Fragmented Area of Balancán, México

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Primates live in social groups to maximize their survival and have complex interaction patterns which are not random. For this reason, Social Network Analysis is a useful framework to understand the complex social structure of primates, as well as individual's roles within the network. Although the use of this method has increased in primatology, it has not been employed to examine social interactions in *Alouatta pigra*. Habitat fragmentation impacts howler monkeys in various ways, including their activity patterns, social structure and behaviours. Using Social Network Analysis, we compared two troops of howler monkeys living in areas with different levels of fragmentation to examine: (1) the role of males and females within the network, using the indices centrality degree and eigenvector, which indicate, respectively, the importance and influence of individuals in the network, and (2) centralization, which indicates how unequal the distribution of centrality is or how much variance there is in the distribution of centrality in the network. We found that females formed stronger bonds with members of their group than did males, and were the core of the network. Males had weaker relationships with their partners and remained peripheral. We did not observe differences in the centralization of the networks, but more data are needed to determine if habitat fragmentation had an affect on the organization of social networks in these animals.

Do Social Networks Inform Us about Welfare? A Case Study with Resocialized Chimpanzees at Fundació Mona

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Chimpanzees are highly sociable apes with a complex social organization. Social network analysis (SNA) has been proved to be a good technique to quantify and analyse social relationships. The use of SNA has increased in the last decade and recently it has been used with captive animals as well. Nevertheless, there has not been a study using SNA with sanctuary chimpanzees. The most important objective in sanctuaries is to ensure and improve the welfare of the animals within them. Our objective has been to determine whether SNA indicators would predict the welfare of these primates. We studied a group of 18 chimpanzees (*Pan troglodytes*) housed at Fundació Mona for 10 years. We used a scan sampling technique to record all social interactions. We calculated social interaction matrices and two social network indices: centrality degree (the number of direct relationships); and eigenvector (central individuals in terms of the global structure of the network). A social proactivity index was also calculated. We quantified the level of welfare through two welfare indices: the behavioural competence index and social competence index. Our results show: (1) a significant positive correlation between centrality degree and behavioural and social competence indices; (2) a significant positive correlation between eigenvec-

tor values and behavioural and social competence indices; and (3) a lack of correlations between social proactivity and both welfare indices. We concluded that welfare degree could be known by identifying the social position of an individual in his social network. This analysis technique would be a good management tool for sanctuaries and primate rescue centres to monitor the rehabilitation and resocialization process of the animals within them.

Rehabilitation of Chimpanzees (*Pan troglodytes*): Sociability, Development of Behavioural Competencies and Welfare

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Early life experiences have a significant impact on the behavioural and social development of non-human primates. One of the most extreme cases of early deprivation can be found in laboratory-housed primates. Nevertheless, little is known about the long-term outcomes of the use of primates in entertainment or as pets. Similarly, a limited number of studies exist of this type of animal and there is little work on their chances of being rehabilitated and resocialised. Our goal has been to monitor and to quantify the rehabilitation and the resocialization process of 12 chimpanzees at Fundació Mona (Girona, Spain). We used focal animal sampling to collect the animals' behaviours (n = 117) from 2013 to 2015. We evaluated welfare using four indices: behavioural competence index (BCI), social competence index (SCI), behavioural diversity index (BDI) and mean welfare index (MWI). We also established which variables may influence the behavioural recovery of chimpanzees with a GLMM test. We found that BCI (F = 5.938; p = 0.008) and BDI (F = 126.759; p = 0.001) decreased from 2013 to 2015 due to the integration of new members in the group. We found no differences between pet and performer chimpanzees but captive-born subjects reached higher levels of behavioural competence (F = 7.786; p = 0.025) and overall welfare (F = 16.150; p = 0.001) than wild-born. Early level of deprivation did not have a clear impact on the rehabilitation process of the chimpanzees. We conclude that some consequences of early life experiences are irreversible or that it might take up to 5 years to detect significant changes. Finally, primate rescue centres have to take into account whether the integration of a new animal will have an impact on the welfare of the whole group.

Social Learning in Chimpanzees: Experimental Evaluation through a Multiple Complex Task

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There is currently a controversy about the nature of chimpanzees' social learning. One of the main issues is focused on chimpanzees' learning abilities and whether this species is able to learn directly from a model's behaviour (copy action) or otherwise learns indirectly through the consequences of the model's actions (copy results). The aim of this study was to evaluate the ability to copy actions and /or results on a sample of 10 chimpanzees (*Pan troglodytes*) from the Fundació Mona through a two-target, complex and sequential puzzle box. The individuals witnessed

different sets of demonstrations under three conditions: (1) control group, without information, (2) results only, without actions (non-social information), (3) actions and results (social information). In each experimental condition, half of subjects observed two different types of sequential order of actions, and component action details. Each participant received eight trials in which they were given access to the puzzle box for manipulation. Subjects' behaviour in each trial was assessed for: (1) type of manipulations, (2) copy actions, (3) copy of sequence order, (4) success, (5) latency, (6) the number and type of transitions between consecutive actions. An overall effect on social learning was detected in the success, type of manipulations and transitions. Individuals in the control group were less efficient, produced more mistakes and failed transitions between actions more than did individuals in the experimental groups. However, there were no significant differences between experimental groups in any of the measurements including copy action and sequence order, where individuals used the same method despite the kind of information they witnessed (social or non-social). They showed no evidence of imitative learning. Instead they extracted information mainly through the consequences of the model's actions or individually.

Protecting the Western Chimpanzee and Threatened Primates from Logging and Illegal Hunting in Guinea Bissau

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Guinea-Bissau is considered a priority area in West Africa for the conservation of the western chimpanzee (*Pan troglodytes verus*) and a regional refuge for other primates threatened with extinction, such as the West African red colobus (*Procolobus badius temminckii*) or the western black-and-white colobus (*Colobus polykomos*). For the last decade, however, habitat destruction and illegal hunting have become powerful forces driving the decline of Guinea Bissau primates. Most primate groups are likely to be confined to pockets of original habitat surrounded by areas profoundly altered by human activities, but the locations of the last remaining primate populations are currently unknown. Lack of a systematic method to define and prioritise the most important areas for conservation impedes concerted actions at a regional-level. This project aims at: (1) developing a long-term, sustainable, country-scale conservation management strategy and (2) articulating primate conservation efforts in Guinea-Bissau. We will survey the current distribution of threatened primates and evaluate their conservation status. Key areas for conservation that harbour vulnerable populations and/or that are relevant to maintain landscape connectivity for multiple species will be located using a combination of genetic and spatial analytical tools and modelling exercises. We will assist the foundation of a collaborative working group dedicated to the conservation of Guinea Bissau primates formed by governmental agencies, NGOs and individual researchers and conservationists. Within the collaborative working group, scientific-based conservation actions towards preservation of relevant areas will be designed and will be included in an updated Action Plan. Results will be disseminated to policy-makers, law enforcers, local communities and the national and international scientific community. Our ultimate goal is to make a significant contribution to the long-term conservation of Guinea Bissau primates. This project is funded by Portuguese Foundation for Science and Technology (SFRH/BPD/88496/2012 and SFRH/BPD/87396/2012), Born Free Foundation and Chester Zoo.

Modelling Gene Flow in the Entire Distribution Range of Guinea Baboons

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Genetic diversity is crucial for the long-term persistence of a species. Retaining genetic diversity can be problematic if populations become fragmented, small and genetically impoverished. Gene flow among sub-populations is a way of preventing such genetic erosion. The persistence of species in fragmented landscapes is, thus, related to the species' dispersal ability across heterogeneous landscapes and the existence of functional connectivity among isolated distribution patches. Guinea baboons (*Papio papio*) are distributed in large parts of the Sahelian and Guinean savannas and woodlands of West Africa. Due to human activities, such as habitat alteration and hunting, the range of Guinea baboons has been significantly reduced and highly fragmented within the last 30 years. This project will investigate range-wide genetic diversity of Guinea baboons and focus particularly on the effects of landscape features (e.g. topography, land cover, human infrastructures) on gene flow among Guinea baboon populations. We aim at: (i) assessing genetic population structuring and genetic diversity across populations; (ii) estimating historical and contemporary gene flow among populations; (iii) identifying landscape features restricting or facilitating gene flow between sub-populations and quantifying their impact on gene flow; and (iv) identifying putative dispersal corridors. Based on our analysis, we will develop historical and contemporary dispersal scenarios, including possible dispersal corridors, which might be useful for conservation planning.

Developing a Tool for Measuring Psychopathologies in Pet and Performing Chimpanzees Using a Simultaneous Top-Down, Bottom-Up Approach

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Some studies show that non-human primates could develop mental disorders homologous to those found in humans such as: post-traumatic stress disorder, complex PTSD, depression, obsessive-compulsive disorder, impulse control disorder, somatoform disorder, antisocial personality disorder and psychopathy and generalized anxiety disorder, among others. A few studies have applied the top-down approach (by using human diagnostic criteria: DSM) to assess psychopathologies in chimpanzees. However those approaches have been criticised because of the methodological drawbacks. In the present study, we improve the top-down methodology by using more raters and testing the agreement between them. However, the top-down approach cannot provide a powerful measure for assessing psychological health in non-human animals who lack language and cannot report their subjective experiences, and also, it may fail to identify human domains that chimpanzees do not exhibit. In contrast, the bottom-up approach (which has not yet been applied to measure psychopathologies in chimpanzees) starts from measurable trait manifestations inherent to the species in natural systems and, therefore, has a great potential to identify ecologically valid dimensions of traits. In conclusion, top-down approaches may permit initial explorations of so far unstudied species, but they ultimately require empirical convergence

with bottom-up findings to validate the comprehensiveness and ecological validity of the trait constructs for each particular species. This research will provide interesting methodological outcomes and engaging results from a phylogenetic and comparative perspective on the evolutionary origins of human psychopathology. Moreover, it could help to find treatment more suitable for these individuals. Finally, this research will provide ethical principles to raise public awareness, and scientific and objective data to promote proper legal protection regarding the sale, possession and use of these species.

Development and the Independence Process in Infant Brown Howler Monkeys (*Alouatta guariba clamitans* Cabrera, 1940)

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The present work deals with the process of independence and development in infants of brown howler monkeys. The study was conducted during 10 months on a troop consisting of 6 individuals inhabiting the 'Campo de Instrução de Santa Maria' (CISM), which is situated in the central region of Rio Grande do Sul state, Brazil. From December 2011 to October 2012, we used 5-min instantaneous sampling sessions with 10-min intervals to register the behaviours of 2 infants (8 h/day, once a month; 352 records/infant). Ventral carrying of infants by their mothers during feeding and locomotion was highest from the first (53%) until the third (50%) month, and then declined. Dorsal carrying of infants had the highest percentages when they were 2 and 3 months old (50%), no infant carrying during displacements was observed from the sixth month until the end of the study. The infants started to walk independently when they were 3 months old, covering short distances, from 1 to 5 m (larger distances, up to 10 m, became common in the fifth month and later). From 6 months old, the frequency of independent locomotion increased dramatically, corresponding to the increasing independence of the infants. During the entire study period, resting was the most common activity ($49.1 \pm 13.3\%$). The lowest percentages of resting occurred during the first two months (15.6 and 40.6%); no increasing or decreasing pattern was observed during subsequent months (42.2–68.8%), and there was no difference between infants (Wilcoxon test, $n = 9$, $Z = 0.41$, $p = 0.68$). A very low frequency of social play ($5.2 \pm 3.9\%$) was recorded, increasing from the fifth month of age, and there was no difference between infants ($n = 9$, $Z = 0.28$, $p = 0.78$). Social grooming was also very low ($1.6 \pm 2.4\%$), as typically described for this genus. This work provides a brief contribution towards an understanding of the ontogenetic development of this species.

Historical and Scientific Review of the Portuguese Non-Human Primatological Collections: Preliminary Results

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Biological collections are a known tool for biodiversity studies, but they also make innumerable contributions to other different scientific, social and historical fields. The ancient collections have an even greater importance for understanding present and former diversity at both the

population and species level. Portuguese museums and university institutions house specimens of non-human primates of worldwide provenance, which are broadly representative of the various families. The majority of them typically represent free-ranging animals captured in ancient times, but the value for research of these collections is greatly reduced due to losses and limited documentation. Until now, a complete catalogue of all specimens of non-human primates did not exist. The aim of this work is to study all the primatological collections in Portugal, including the historical context of the collections and a review of all the non-human primate taxa in order to create an up-to-date electronic catalogue to enable remote access to them through the web. Here, some preliminary results of a first census are presented. The main institutions that currently house non-human primates are the Museum of Porto (e.g. there are specimens of *Gorilla gorilla gorilla* collected in Angola, a former Portuguese colony) and the Natural History Museum of Coimbra, which houses the largest collection in the country and many of these specimens are from 19th century 'philosophical travels' (e.g. A. Rodrigues Ferreira in the Brazilian Amazon, genera *Chiropotes* spp., *Lagothrix* spp., *Cebus* spp., etc.). Many specimens from these expeditions were previously part of the old core of the Bocage Museum of Lisbon, but unfortunately, after the disastrous fire of 1878, almost all the primatological collection was destroyed. Smaller collections of primates are housed in institutions such as the Military College and other former Portuguese high schools where they were used for educational purposes, or in small historical museums in Lisbon.