MPIG
Midwest Primate Interest Group

MIDWEST PRIMATE INTEREST GROUP
ABSTRACTS
Annual Meeting 2008--University of Notre Dame, September 19-20, 2008

Poster Presentation:

A preliminary comparison of seed dispersal in two howler monkey species (*Alouatta Palliata and Alouatta pigra*)

Katherine R. Amato[1], Alejandro Estrada[2]

[1]University of Illinois Champaign-Urbana, [2]Universidad Nacional Autónoma de México, Instituto de Biología: Estación Biologica Los Tuxtlas.

Seed dispersal is an important aspect of tropical forest dynamics, and primates and coprophagic beetles play an integral role in the process. Primates disperse fruit seeds in their feces, while some species of coprophagic beetles which are attracted to these feces continue the process of dispersal by burying seeds present in the feces. Two species of howler monkey exist in the tropical forests of southern México: the mantled howler monkey (*Alouatta palliata),* found throughout Central America, and the endemic black howler monkey (*Alouatta pigra).* This study compares patterns of seed dispersal between these two species as it relates to foraging and traveling behavior, and also investigates secondary dispersal by the coprophagic beetle species associated with each primate species. The results suggest that both the mantled howler monkey and the black howler monkey disperse similar amounts and diversities of fruits across similar distances. Males and females were also found to have equal roles in seed dispersion in both primate species. Each howler species, however, appears to exhibit differences in preference for certain fruit species. Furthermore, a larger and more diverse coprophagic beetle population is associated with the mantled howler monkey than with the black howler monkey, indicating the possibility of more effective secondary dispersal. Thus, while the two primate species disperse seeds in a similar fashion, the entire seed dispersion cycle associated with each appears to differ. This study provides preliminary data describing these cycles, but further research is needed to broaden the scope of the study.

Keywords: *A. pigra, A. palliata*, howler monkey, seed dispersion, coprophagic beetle

E-mail: katie.amato.07@alum.dartmouth.org.

Poster Presentation:

Hormonal and Epidemiological Monitoring of Animal Reproduction and Health at Cleveland Metroparks Zoo

Laura Amendolagine, Pam Dennis, D.V.M., Ph.D., Nga Nguyen, Ph.D.

Conservation & Science, Cleveland Metroparks Zoo, Cleveland, OH

Cleveland Metroparks Zoo (CMZ) is one of a few zoological parks in the world with an on-site facility for measuring hormones in animal biological materials. CMZ's Wildlife Endocrinology Laboratory is equipped to measure hormones in blood, saliva, urine, and feces using both radioimmunoassay (RIAs) and enzymeimmunoassays (EIAs) techniques. In addition to endocrinology, CMZ has joined forces with The Ohio State University's College of Veterinary Medicine in supporting the Epi-Zoo program which explores the epidemiology of infectious and non-infectious diseases of captive and free-ranging wildlife. The goals of CMZ's Wildlife Endocrinology Laboratory and Epi-Zoo Program are to (1) generate new and valuable information to assess animal behavior, reproduction, health and well-being, and (2) provide education and research opportunities in wildlife endocrinology and health. Currently, staff scientists and student volunteers in the Endo Lab are (a) investing the endocrine correlates of successful parenting in two captive African elephant mothers, (b) monitoring reproductive hormones and behavior in four pairs of captive African white-backed vultures, and (c) examining reproductive and stress physiology in a wild population of geladas living at Guassa, Ethiopia. In addition, researchers and students in the Epi-Zoo program are currently conducting a multi-institutional assessment of health and well-being in captive Western lowland gorillas in zoological parks across North America. We present highlights from our ongoing projects and discuss future directions for research in animal health and reproduction at Cleveland Metroparks Zoo.

Podium Presentation:

Flexible diets help bearded saki monkeys survive in forest fragments

Sarah Boyle[1], Wilson Spironello[2], Andrew Smith[3]

[1]Ivy Tech, Bloomington, IN, USA; [2]Instituto Nacional de Pesquisas da Amazônia, Manaus, Amazonas, Brazil; [3]Arizona State University, Tempe, AZ, USA

Bearded sakis (*Chiropotes spp.)* have large social groups, large home ranges, and a large proportion of fruit and seeds in their diet. Such characteristics have been used to conclude that bearded sakis would not survive in small forest fragments. Here we present data on the feeding ecology of northern bearded saki monkeys (*Chiropotes satanas chiropotes*) living in forest fragments in the Brazilian Amazon. Data were collected from January

2005-June 2006. When northern bearded saki monkeys were present in a study area during a cycle, the group was followed from dawn till dusk for three consecutive days. Behavioral scans and GPS locations were taken every five minutes. The bearded sakis ate 244 plant species, and 64% of these species were considered unique among the bearded saki groups. Seeds represented 78.37% of all feeding scans, with bearded saki monkeys living in forest fragments consuming a similar amount of seeds, and a similar diversity of plant species, as those monkeys living in the continuous forest. The variety of plant species consumed by the monkeys may enable them to reside in small forest fragments; however, these groups living in the fragments may experience greater resource depletion and lower reproductive success.

Keywords: Forest fragmentation, *Chiropotes*, feeding ecology

Email: sarahannboyle@gmail.com

Poster Presentation:

Play Behavior in Three Sympatric Species: Mantled Howler Monkeys (*Alouatta palliata*), White-Faced Capuchin Monkeys (*Cebus capucinus*), and Black-Handed Spider Monkeys (*Ateles geoffroyi*)

Rebecca S.A. Brittain [1], Teal L. Larsen [2], Natasha A. Niday [3], Kelly E. Reina [4]

[1] Department of Anthropology, Grand Valley State University, [2] Department of Anthropology, Indiana University, [3] Department of Biology, Hanover College, [4] Department of Psychology, University of Michigan

For many mammals and especially for primates, play behavior is crucial in developing fundamental social skills and for improving motor skills. This study explored differences in the level of play between the three sympatric subject species: mantled howler monkeys (*Alouatta palliata*), white-faced capuchin monkeys (*Cebus capucinus*), and black-handed spider monkeys (*Ateles geoffroyi*). Contextual data of play at the troop level was examined and analyzed, as were the differences between age classes and the amount of play observed. To address these variables, behavioral observations were collected using instantaneous focal sampling at one minute intervals for a collective total of 50.07 hours on the three species. All observations were carried out at El Zota Biological Field Station and in Puerto Viejo, Costa Rica. Analysis of data revealed that there was a notable difference in the amount of play exhibited between species; mantled howlers engaged in less play than white-faced capuchins and black-handed spider monkeys. Play was more likely to occur during group resting. Lastly, play was most common among the juvenile age class.

Keywords: Play behavior, howler, capuchin, spider

Rebecca S.A. Brittain: brittair@student.gvsu.edu
Teal L. Larsen: mllarsen@indiana.edu
Natasha A. Niday: nidayn@hanover.edu
Kelly E. Reina: kerei@umich.edu

Podium Presentation:

Adrenarche in Comparative Primate Perspective

Benjamin Campbell, Department of Anthropology, University of Wisconsin-Milwaukee

The function of adrenarche, the prepubertal rise in adrenal production of depiandrosterone and its sulfate (DHEA/S), remains unexplained. However, recent findings that DHEA/S alters the effects of cortisol on adipose tissue suggest that DHEA/S may play a role in shifting energy allocation. The existence of adrenarche among humans and the African apes, but not other anthropoid primates, suggests that adrenarche marks a derived life history stage in these species, which may be related to slow somatic growth, extended brain maturation and the development of immunocompetence. Here we compare available data on DHEA/S, somatic growth and social development across humans, chimps, macaques and baboons. Declining levels of DHEA/S bears little relationship to the timing of somatic or social development in macaques or baboons. In humans on the other hand, adrenarche appears closely aligned with other markers of middle childhood, including the eruption of permanent teeth, the adiposity rebound, and increasing social independence from parents. Data from chimpanzees demonstrate the existence of adrenarche, but lack adequate data for comparison with patterns of somatic and social development. More work on adrenarche in chimps is called for to understand if it marks a similar developmental stage as in humans.

Keywords: adrenarche, DHEA, life history, comparative primate biology

Email: campbelb@uwm.edu

Poster Presentation:

Paternal Relationships in a Captive Orangutan

Christine M. Cassella and Kristen E. Lukas

Cleveland Metroparks Zoo and Case Western Reserve University

Adult male orangutans are rarely social in the wild, and interactions in this context are limited primarily to consortship with females and occasional territorial disputes. This lifestyle limits the likelihood of direct paternal behaviors. However, orangutans as a species are generally more social in captive environments, and adult males in particular

are capable of sociality in captivity that would likely never be witnessed in wild-living orangutans. Although some reports have noted that adult male orangutans interact with immature group members in captivity, there is a lack of research that has specifically examined orangutan male preference for related offspring or direct paternal behaviors. Thus, the current study explored the behavior of an adult male orangutan at Cleveland Metroparks Zoo by collecting data on his social behaviors (both initiated and received) and proximity with related and unrelated group members. The adult male interacted infrequently with his reproductive partner, but interactions with a 2-year old male offspring increased over time and a distinct preference was observed for initiating, maintaining proximity, and engaging in social behaviors with an adolescent offspring compared to another unrelated adolescent of similar age.

Keywords: orangutan; paternal behavior; captive behaviour

Podium Presentation:

Colonization of Mesoamerica by howler monkeys: genetic support to the two-wave hypothesis.

Liliana Cortés-Ortiz, Museum of Zoology and Department of Ecology and Evolutionary Biology, University of Michigan

Molecular analyzes support the distinction of two howler monkey species in Mesoamerica, *Alouatta palliata* and *A. pigra*. The former is distributed from southern Veracruz in Mexico throughout Mesoamerica, and extending to the Choco region in Colombia, Ecuador and northern Peru. *A. pigra*, has a more restricted distribution that is limited to the Peninsula of Yucatan, Belize and Guatemala. Phylogenetic analyses using mtDNA sequence data confirm that these taxa are sister species that diverged about 3 mya. Analyses of mitochondrial and nuclear DNA markers were conducted to investigate population genetic structure of both species and infer patterns of dispersal. Genetic differentiation quantified by calculating pairwise F_{ST} (θ) and R_{ST} (Rho) values from mtDNA and microsatellite data respectively, revealed structuring both between *A. palliata* and *A. pigra*, and among populations of both species. *A. palliata* populations showed a reduction in genetic variation from south to north, consistent with the hypothesis of a south to north colonization for this species. *A. pigra* holds more genetic variation than do northern populations of *A. palliata*, but levels of diversity are comparable to southern populations of *A. palliata*. Altogether, genetic data support the hypothesis that *A. pigra* initially colonized Mesoamerica followed by a more recent invasion by *A. palliata*.

Keywords: *Alouatta palliata*, *Alouatta pigra*, phylogeography, population genetics.

E-mail: lcortes@umich.edu

Podium Presentation:

A preliminary investigation of the variable distribution of copulatory plugs among female rhesus macaques.

J.L. Danzy[1]; V.T. Gutierrez[2]; J.D. Pampush[1]

[1]Department of Anthropology, University of Wisconsin at Milwaukee; [2]Department of Sociology-Anthropology, New Mexico State University

Copulatory plugs and seminal coagulates are considered to facilitate sperm competition although their mechanisms are not fully understood (see Dixson and Anderson, 2002). We conducted a three month observational study of female mating behavior on Cayo Santiago in 2006; we examined the potential relationships between the distribution of copulatory plugs among females and female coloration, behavior, pregnancy and parity status.

Our results indicate an uneven distribution of copulatory plugs among females; nonparous females received more sperm plugs per observed mating (86%) than multiparous females (25%). While there appears to be a correlation between parity and copulatory plug development, a two-way ANOVA revealed that pregnancy status more directly effects copulatory plug formation ($p<.001$). We found no significant difference in behavioral rates between plug and non-plug days. Among multiparous females, genital saturation ($p<.05$) and genital hue ($p=.07$) were higher on plug days than on non-plug days; facial coloration was unrelated to copulatory plug rates.

We suggest that although copulatory plugs are generally thought of in terms of male physiology, plugs may also be dependent on female physiology. These preliminary results suggest that further investigation of the variable distribution of copulatory plugs is necessary for understanding both male and female reproductive strategies.

Keywords: rhesus macaques, copulatory plugs, Cayo Santiago

Podium Presentation:

Exudate Production and the Ecology of Exudate Feeding in *Saguinus* and *Callimico*

Paul A. Garber[1] and Leila M. Porter[2]

[1]Department of Anthropology, University of Illinois, Urbana, Illinois,
[2]Department of Anthropology, Northern Illinois University, Dekalb, Illinois

Callithrichines are small-bodied New World primates characterized by anatomical, behavioral, and physiological adaptations that enable individuals to exploit plant exudates. However, little is known concerning rates of exudate production and availability of exudates to primate consumers. In this investigation we present data on

patterns of exudate feeding in a mixed species troop of tamarins (*Saguinus mystax* and *S. fuscicollis*) in northeastern Peru, and a group of callimicos (*Callimico goeldii*) in northern Bolivia. In addition we collected data on the amount and renewal rate of exudates produced from naturally occurring and experimentally induced wounds to tree species exploited by *Saguinus*, *Callimico*, and *Cebuella*. Our results indicate that exudates are available to nongouging primate foragers during all months of the year. In Saguinus, exudates from tree trunks, Parkia pods, and holes gouged by pygmy marmosets accounted for 16.3% of total plant feeding and foraging time. In the case of Callimico, stilt root exudates, Parkia pod exudates, and trunk exudates accounted for 15.4% of plant feeding and foraging time. Daily exudate production on individual trees (N=19) varied from 0 grams per day to 10.75 grams per day. Total monthly trunk exudate production in naturally occurring wounds present on sample trees (N=5) ranged from 0 grams to 369 grams, although the greatest. Pod exudates were available principally during the dry season, whereas trunk exudates were available during all months of the year. We argue that tamarins and callimicos track the location, availability, and production of exudate sources in their home range, and that trunk, stilt root, and pod exudates represent an important, reliable, and renewable resource for these non-gouging callitrichines.

Keywords: feeding ecology, tamarins, callimicos, exudates production, resource renewal

Email: p-garber@illinois.edu

Poster Presentation:

Tool Manipulation in Cotton-top Tamarins (Saguinus oedipus)

Veronica Geretz[1], Dr. Kimberley Phillips[2], Valerie Gilbert[2]

[1]Westminster College, [2]Hiram College

Investigating tool use in non-human primates allows researchers to understand when advanced skills were developed evolutionarily in the primate order. Researchers need to illuminate how complex an understanding primates possess about the tools they potentially use. Cotton-top tamarins (*Saguinus oedipus*) in captivity have been shown to use tools in past research. Tamarins' ability to manipulate tools, a more specific aspect of tool use requiring reorientation of a tool, has not been revealed through past investigations. The current study used more proportionally sized tools than past research has employed to investigate the possibility that tamarins in past studies did not attempt to manipulate objects because the size of the tools was too large. Six subjects were presented with both a cane (6 – 12 cm in length) within reach and a food reward out of reach. The food reward could have been retrieved by reorienting the cane (turning it 180º). Although subjects did not attempt to manipulate the tools, a post-hoc analysis revealed a left hand preference for 2 of the 6 subjects. The results indicate that although tamarins possess the propensity to use tools, manipulating tools requires motor-skills or a means- end understanding tamarins do not possess.

Keywords: cotton-top tamarins, tool use, manipulation, handedness

E-mail: geretzvj@westminster.edu

Poster Presentation:

Prey Capture Strategies of Brown Capuchins (*Cebus apella*)

Kaitlyn M. Hellner-Burris, Valerie R. Gilbert, & Kimberley A. Phillips

Departments of Psychology and Biology, Hiram College, Hiram OH 44234

Morphological sex differences in the CC:brain ratio are found in capuchins, including regions involved in motor processing (anterior midbody) and spatial-ability (splenium), with males having smaller ratios than females. The functional significance of this is unclear, but may be related to behavioral laterality in cognitive and visuospatial tasks. Behavioral data investigating sex differences in spatial abilities in the context of foraging, such as prey capture, are needed to understand the functional significance of morphological differences in the corpus callosum. The purpose of this investigation was to explore prey capture strategies of brown capuchins. Six subjects (female n=4; male n=2) were presented with opportunities to catch goldfish from a kiddie pool. We recorded the number of attempts, as well as which hand was used in each attempt, for a maximum of 5 minutes. Subjects performed 4.8 $\pm$ 4.3 attempts per trial and were successful in 19.6% of attempts. A bimanual strategy was used in 43% of attempts and a unimanual strategy was used in 57% of attempts. The bimanual strategy was more successful, with captures occurring in 26.6% of these attempts and only 14.3% occurring in unimanual attempts. These preliminary data suggest females used both strategies almost equally, whereas males preferred to use a unimanual strategy. Both sexes were more successful with a bimanual strategy, with a larger difference in success rate seen in the female capuchins.

Keywords: prey capture; sex differences in foraging; *Cebus paella*

Email: burriskm@my.hiram.edu

Poster Presentation:

Do Geophysical Factors Impact Parasite Species Diversity in Balinese Macaques (*Macaca fascicularis)*?

Concerta Holley, Kelly Lane, Agustin Fuentes, and Hope Hollocher, University of Notre Dame

Diarrheal diseases are the third leading cause of all deaths worldwide. Gastrointestinal parasites often do not discriminate between humans and wildlife, thus understanding infectious disease in non-human primates is paramount for disease management strategies. Here, we investigated the impact of host environment to determine if parasite species diversity would be dependent on those factors. We hypothesized that species diversity would be positively impacted with high water availability, forest habitat, and high tourism rates. Parasite abundance was measured using standard parasitological techniques, and Shannon-Wiener indices of diversity and evenness were used for evaluating species diversity. Population level parasite species diversity was significantly different between habitats and water availabilities, clustering populations by environmental factors but not by region or tourism rates. Future studies will include expanded analysis of protozoan data, analysis of global parasite patterns, and exploration of the role of human social dynamics and demographics in spatial distributions of parasitism.

Poster Presentation:

Effects of habitat density and other variables on the fundamental frequency of the nonhuman primate long call

Aimee J. Hosemann and Susan M. Ford, Southern Illinois University

Long calls are highly stereotyped calls used by primates to communicate across distances; the function of these calls has been debated. Habitat structure has been considered a shaping force of the acoustic structure of nonhuman primate long calls as part of the local adaptation hypothesis (Brown et al. 1995). This study examines the effect of phylogeny, habitat density, diet, and social and mating systems as seen through the structure of the fundamental frequency (the lowest frequency of the call). Frequency and call duration measurements were taken from published spectrograms of the calls of 54 species. Only the fundamental frequency of the first phrase from each spectrogram was used; the first phrase is defined as the first group of notes produced in the long call separated from the second by a brief pause. Cladograms built in PAUP* and MacClade using frequency data as character states were compared to established phylogenies, demonstrating that phylogeny does not exert total control over long call structure. ANOVA and post hoc tests were performed comparing frequency data with habitats, diets, and social and mating systems. Diet and social structure were more strongly correlated with the structure of primate long calls than were habitat or phylogeny.

Keywords: vocalization, long calls, habitat, diet

Aimee J. Hosemann: password@siu.edu
Susan M. Ford, sford@siu.edu

Poster Presentation:

Encouraging Gummivory in Captive Callitrichids

Hillary Huber and Kerrie P. Lewis, Texas State University- San Marcos, Department of Anthropology

It is estimated that the gums exuded from trees comprise 5 - 75% of the diet of callitrichids, depending upon the species. However, no recent data exist for gum eating in captive marmosets and tamarins. This study evaluates the current state of food-based environmental enrichment in captive callitrichids, with emphasis on techniques that stimulate extractive foraging and gum feeding behavior. Data were collected from 45 zoos in ten countries via a web-based survey, with additional visits to both the Phoenix and Houston zoos for follow-up data collection. The majority of the responding zoos provide gum-based enrichment to marmosets, but fewer than half provide gum to tamarins. Most (~85%) gum fed in captivity is in the form of powder mixed with water or juice. The remaining zoos use raw gum or crystallized gum arabic. Enrichment methods vary widely, but include gum served in dishes, spread on branches, inserted in holes, and contained in other extractive foraging devices. This study assesses each method of gum-based dietary enrichment, and its impact on the feeding behavior of zoo-housed callitrichids. Since environmental enrichment that stimulates naturalistic behavior promotes the psychological wellbeing of animals, further applications and feeding device designs are discussed.

Keywords: callitrichids, gummivory, exudates, enrichment, zoos

Podium Presentation:

Aggression, Risk Sensitivity, and Orbitofrontal Cortex Volume in the Genus *Pan*

Shawn Hurst
Indiana University Department of Anthropology

The orbitofrontal cortex (OFC) helps modulate aggressive impulses through inputs to the amygdala and by assessing reward value (medial OFC) and negative consequences (lateral OFC). These areas are sexually dimorphic; lateral OFC tends to be relatively larger in women while medial OFC tends to be larger in men. This suggests sex differences in aggressive behaviors may be partly due to men having more cortex for recognizing (and biasing them towards) rewards and simple reinforcers while women have relatively more tissue devoted to considerations of risk.

Because chimpanzees are more sexually dimorphic and show stronger sex differences in risky/aggressive behaviors than humans, we should expect even larger OFC dimorphism in the chimpanzee brain. Due to dominance overlap between sexes and the reduced levels

of aggression seen in bonobo society, we should also expect OFC areas to be less sexually dimorphic in bonobos than in chimpanzees.

Region-of-Interest techniques were used to measure the lateral and medial OFC in 12 chimpanzee and bonobo MRIs. Male chimpanzees have larger medial than lateral OFC volumes while bonobos and female chimpanzees have the reverse pattern, consistent with observed behavioral differences.

Keywords: Chimpanzees, Bonobos, Risk, Aggression, Brain

Email: shhurst@indiana.edu

Podium Presentation:

Habituation: tool for successful ecotourism or Pandora's box?

Laurie Kauffman and Sue Boinski

Department of Anthropology, University of Florida

Ecotourism is often thought of as a benign solution to habitat loss. Ecotourism proponents hope that tourism can grow economies while simultaneously helping to conserve an area's natural resources. In order to be successful, ecotourism must both satisfy the tourists and have minimal impact on the animals who are the subject of ecotourism.
This research is part of a larger study investigating the responses of seven primate species to tourists in the Central Suriname Nature Reserve. We found that primate response to tourists varied by species, but that the best cross-species predictor of primate responses was level of habituation. Monkeys contacted within a long term study site displayed, alarm called and fled less when contacted by tourists than monkeys contacted where humans were less often present.
Habituation would seem to be a good tool to use in order to lessen primate disturbance by tourists, and also to increase tourist satisfaction. However, there are dangers inherent in habituation. Factors such as the future use of the area, whether tourists will be unsupervised around the primates, and possibility of aggression or disease transmission should all be assessed before habituating primates for tourism.

Keywords: ecotourism, Suriname, habituation, conservation

Email: laurie.kauffman@gmail.com

Podium Presentation:

The evolution of size difference between *Alouatta palliata* and *A. pigra*

Mary Kelaita[1] and Liliana Cortés-Ortiz[2]

[1]University of Michigan Department of Anthropology, [2]University of Michigan Museum of Zoology & Department of Evolutionary and Ecological Biology

The New World monkey species, *Alouatta palliata* and *Alouatta pigra*, whose common ancestor may have existed around 3mya, differ significantly in overall size. Despite their recent divergence, the two species can also be distinguished on the basis of their unique mating systems, where *A. pigra* groups tend to have one male controlling reproductive access to females, and *A. palliata* groups consist of several males having access to females during the same estrus period. This study encompasses morphological data acquired from wild individuals captured in Southeastern Mexico, specifically in the states of Veracruz, Tabasco, Campeche, and Quintana Roo. *A. pigra* was found to be significantly larger in size (e.g. weight and total length, $p < 0.0001$). Conversely, testicular dimensions are significantly greater in *A. palliata* (length and breadth, $p < 0.0001$). Although the differences in testes size may reflect *A. palliata*'s mating strategy and sperm competition, it is unclear whether sexual selection is the cause of the overall size difference between the two species. Under the scenario of sexual selection, one would expect greater sexual dimorphism as well as larger canines in *A. pigra*, which is not the case in our data. Alternatively, natural selection may be a more plausible explanation for the overall difference in size.

Keywords: Alouatta palliata, Alouatta pigra, size difference, morphology

Email: mkelaita@umich.edu

Podium Presentation:

Prevalence, abundance, and spatial dynamics of intestinal parasites in wild long-tailed macaques (*Macaca fascicularis*).

Kelly E. Lane, Hope Hollocher, Agustin Fuentes; University of Notre Dame

Host and parasite population dynamics are strongly influenced by the reciprocal interplay between host, parasite, and the landscape of which they are an integral component. While traditional parasitology focuses on the deleterious effects of parasites, the shift towards studying parasitology from an evolutionary perspective has brought new insight into the role of the environment in host-parasite interactions. Here, we present an examination of parasite intensity, prevalence, and aggregation among wild populations of

long-tailed macaques (*Macaca fascicularis*) across the Indonesian island of Bali. Specifically, we investigate the impact of environmental, geophysical, and anthropogenic factors on the spatial distributions and dynamics of these parasites. Bali's unique religious-agricultural structure has led to the development of an island wide temple system which may act as sanctuary for macaque populations and places these macaques in close spatial proximity to high density human populations. While the potential for exposure to shared human-macaque gastrointestinal parasites in this system is thus high, we demonstrate the significant role specific environmental, geophysical, and anthropogenic factors have on the spatial distribution, prevalence, and intensity of these parasites. This analysis contributes to the understanding of the macaque as both paratenic and reservoir host of gastrointestinal parasites.

Keywords: parasite intensity, prevalence, aggregation, long-tailed macaques, geophysical influence

Poster Presentation:

Surveying local knowledge and perspectives towards primate conservation within an ecotourism community.

S.M. Lindshield[1,2] and B. Gomila[3]

[1]Ecology and Evolutionary Biology Program, Iowa State University, Ames, IA and
[2]Department of Anthropology, Iowa State University, Ames, IA and
[3]Gibraltar Land Reclamation Company Limited, Gibraltar.

Recent reports of dramatic primate population declines in Costa Rica, resulting from anthropogenic interactions, raise primate conservation concerns in this Central American country. In the south Caribbean region of Talamanca, a developing area with a major ecotourism economy, we surveyed 29 residents about primates, conservation, development, and tourism to assess which anthropogenic factors most affect the primate community (*Alouatta palliata*, *Ateles geoffroyi*, *Cebus capucinus*). Survey results indicate that most individuals believe wildlife conservation efforts are necessary and prefer to prevent the establishment of large-scale tourism projects, such as high-rise hotels and marinas. Despite this common perspective, development in the Talamanca region has resulted in habitat loss, fragmentation, and degradation, which impact the primate population. Conserving primates and their habitat is in the economic interest of residents, as ecotourism in Talamanca generates jobs and income, and promotes governmental services that often improve the quality of life for residents. Therefore, land owners and developers should incorporate primate habitat into land management strategies through linking forest fragments with corridors and reserving land for reforestation and conservation in order to minimize the negative effects of development on Talamanca's primates.

Podium Presentation:

Macachiavellian Intelligence: How Rhesus Macaques and Humans Have Conquered the World.

Dario Maestripieri, The University of Chicago

Humans and rhesus macaques are among the most successful primates on this planet. In part, their evolutionary success may be the result of their ecological characteristics as "weed" species: an omnivorous diet, high mobility and adaptability to new environments, ability to reproduce under a wide range of environmental conditions, and resilience to adversity and stress. In part, their success may be due to their intelligence, including their social intelligence. I suggest that humans and rhesus macaques share a set of similar social tendencies, collectively referred to as Macachiavellian intelligence, characterized by a gregarious and aggressive temperament, high individualism and social opportunism, tendency to form despotic and nepotistic social systems in which individuals do not compete directly for resources but for power, strong xenophobia, and high within-group cohesiveness under conditions of external threat. Rhesus macaques exhibit their Macachiavellian tendencies in any environment in which they find themselves, whereas humans are most likely to exhibit such tendencies in capitalistic societies or when strong cultural influences on their behavior are eliminated. I hypothesize that the Macachiavellian intelligence of humans and rhesus macaques arose by convergent evolution during long periods of intense within- and between-group competition in the evolutionary history of these species. I also hypothesize that their Macachiavellian intelligence gave humans and rhesus macaques an edge in the ecological competition with other related species, and also served as a selective engine for the further evolution of larger brains and complex intelligence.

Keywords: rhesus macaques, social intelligence, nepotism, despotism, competitiveness, human convergent evolution.

Email: dario@uchicago.edu

Poster Presentation:

EthoSearch: the Ethogram Archive Project

Sue W. Margulis[1], Anne B. Clark[2], Weiyi Meng[2]

[1] Lincoln Park Zoo, Chicago IL
[2] Binghamton University, Binghamton, NY

Ethograms are fundamental to quantitative behavioral research in providing clearly defined and illustrated units of behavior. As collaborative research grows, having a

standard database of ethograms becomes critical. In 2000, a diverse group of behavioral scientists representing members of the Animal Behavior Society, Association of Zoos and Aquariums, International Society for Behavioral Ecology, and the American Psychological Association founded "Ethosource", envisioned as a centralized web-based tool to share and interpret behavioral data. The EthoSource group continues to work towards mechanisms for fostering collaborative studies and sharing behavioral data. We here describe **the Ethogram Archive Project (EAP)** whose goal is the development of a central tool**, EthoSearch.** EthoSearch will provide associated tools for searching, adding and relating ethograms in the archive to each other. Beginning with primates as one of the core taxonomic groups with which to initiate the archive, EthoSearch will provide a valuable tool for a wide range of users in the primatological community. Here, we describe the development of the Ethogram Archive, and the vision for its long-term use and maintenance. We call upon our colleagues to submit ethograms to the archive, serve as expert reviewers, and utilize the searching and concatenating tools of the archive.

Keywords: Ethogram; database; collaborative research

Email: smargulis@lpzoo.org

Podium Presentation:

Population dynamics of provisioned white-faced capuchins (*Cebus capucinus*) at the Refugio de Vida Silvestre Curú, Costa Rica.

Tracie McKinney

Department of Anthropology, The Ohio State University

Increasingly anthropogenic habitats require scientists to consider human disturbance in studies of primate behavior, ecology and life history. Population dynamics and life history variables are sensitive to ecological change, and may reflect long-term consequences of habitat alteration. Provisioning has previously been correlated with increased birth rates, shortened inter-birth interval and weaning time, and heightened infant mortality, and infanticide risk is arguably a symptom of extreme habitat disturbance. This report presents a history of births, infant deaths, and inter-birth intervals in a heavily provisioned troop of white-faced capuchin monkeys (*Cebus capucinus*). Over the 2-½ year study period, there were 14 known births to seven adult females, with a mean birth rate of 0.71. Inter-birth interval averaged 21 months ($n = 4$) after a surviving infant, and 8.3 months ($n = 3$) after infant death. Of the 14 infants, four disappeared in association with recent male take-over, and one infant survived a witnessed attack by a subordinate resident male. These preliminary data support the sexual selection hypothesis for male infanticide, although the relationship between disturbance and infanticide risk is still unknown. The data also suggest that life history variables such as inter-birth interval and birth rate are influenced by a human-altered diet.

Keywords: *Cebus capucinus*; infanticide; inter-birth interval; birth rate

Email: mckinney.159@osu.edu

Podium Presentation:

Object use among zoo-housed chimpanzees (Pan troglodytes) and gorillas (Gorilla gorilla gorilla) and their propensities for termite fishing at an artificial termite mound.

Marissa S. Milstein, Elizabeth V. Lonsdorf, Stephen R. Ross, Katherine E. Wagner, Sara A. Linick

Lester E. Fisher Center for the Study and Conservation of Apes, Lincoln Park Zoo.

Great apes have been observed to manipulate a variety of objects, including tools. Here, we compare individual propensities for general object manipulation to the frequency of fishing behaviors in one group of chimpanzees (n=7) and two groups of gorillas (n=6, n=5) at an artificial termite mound at Lincoln Park Zoo, Chicago, IL. Each group had access to the mound which was baited using a randomized schedule alternating between control and bait days. The apes had access to natural materials to create their own tools and the mound was videotaped daily. Live behavioral data was taken to record general object use. We confined our analyses to individuals over 4 years of age, since that is the youngest age at which they fish in our population. We found that 1) chimpanzees were more likely to use objects than gorillas ($F_{1,12} = 14.2$, $p = 0.003$ and 2) individuals who were more inclined to use objects spent more time fishing ($F = 155.9$, $N = 14$, $p < 0.0001$, $R^2 = 0.93$). These results demonstrate a positive relationship between general object manipulation and tool use in a more specific foraging task. Future studies should investigate if these behaviors co-occur or if proficiency in object manipulation precedes fishing.

Keywords: chimpanzees, gorillas, object use, tool-use

Poster Presentation:

"Friendships" Between New Mothers and Adult Males: Adaptive Benefits and Determinants in Wild Baboons (*Papio cynocephalus*)

Nga Nguyen[1,2,Ɣ], Russell C. Van Horn[3], Susan C. Alberts[4,5], Jeanne Altmann[2,5,6]

[1] Department of Conservation & Science, Cleveland Metroparks Zoo, Cleveland, OH 44109, e-mail: ntn@clevelandmetroparks.com
[2] Department of Ecology & Evolutionary Biology, Princeton University, Princeton, NJ 08544

[3] Consevation & Research for Endangered Species, Zoological Society of San Diego, San Diego, CA 92112
[4] Department of Biology, Duke University, Durham, NC 27708
[5] Institute for Primate Research, National Museums of Kenya, Nairobi, Kenya
[6] Department of Animal Physiology and Veterinary Medicine, University of Nairobi, Nairobi, Kenya

Close associations between adult males and lactating females and their dependent infants are rare in non-monogamous mammals. However, such associations [called 'friendships' (Smuts 1985)] are regularly observed in several primate species in which females mate with multiple males during the fertile period. The absence of mating exclusivity among 'friends' suggests males should invest little in infant care, raising questions about the adaptive significance of friendship bonds. Using data from genetic paternity analyses, patterns of behavior, and long-term (>30 years) demographic and reproductive records, we evaluate the extent to which friendships in four multi-male, multi-female yellow baboon (*Papio cynocephalus*) groups in Amboseli, Kenya represent joint parental care of offspring or male mating effort. We found evidence that mothers and infants benefited directly from friendships; friendships provided mother-infant dyads protection from harassment from other adult and immature females. In addition, nearly half of all male friends were the genetic fathers of offspring and were observed mating with mothers during the days of most likely conception. In contrast, nearly all friends who were not fathers were also not observed to consort with the mother during the days of most likely conception, suggesting that friendships between mothers and non-fathers did not result from paternity confusion. Finally, we found no evidence that prior friendship increased a male's chances of mating with a female in future reproductive cycles. Our results suggest that, for many male-female pairs at Amboseli, friendships represented a form of biparental care of offspring. Males in the remaining friendship dyads may be trading protection of infants in exchange for grooming services and the chance to increase their attractiveness as mates to other females. We discuss the implications of our study for understanding the evolution of year-round male-female bonds.

Poster Presentation:

Seed dispersal comparison between mantled howler monkeys (*Alouatta palliata)* and black-handed spider monkeys (*Ateles geoffroyi*) in Costa Rica

Meredith Palmer, Department of Zoology, Ohio Wesleyan University

Primates are important agents of seed dispersal for tropical forest trees. At the El Zota Biological Field Station in Costa Rica, we compared the advantages conferred to seedling through consumption and translocation by two sympatric primate species, the mantled howler monkey (*Alouatta palliata*) and black-handed spider monkey (*Ateles geoffroyi*). In a three-part project spanning ten days, activity budget data for both species (feeding on fruits, feeding on leaves, resting, traveling, and social interactions) were collected using ten-minute continuous focal animal sampling. Feces were gathered and

temperature, humidity, and canopy cover (on a scale of 1-5) of the areas of deposition were recorded. Seeds were removed from the feces (N=9 *Virola* spp. from spider monkeys; N>100 *Hyeronima* spp. from howler monkeys) and grown with control seeds from ripe fruits (N=27 *Virola*; N=48 *Hyeronima*) in three forest locations corresponding to 1, 3, and 5 levels of canopy-cover.

Results indicate that, while spider monkey-defecation increases the amount of seeds that germinate (44.44% vs. 18.52%) and shortens the latency period in "light" environments (canopy-cover 1-3; 12 vs. 26 days), spider monkeys tend to defecate in areas less than favorable for germination (canopy-cover 4). Howlers defecated most often in areas conducive but not optimal for *Hyeronima* germination (canopy-cover 3); defecation increased the number of seeds that germinated (62.50% vs. 12.50%) only if all of the pulp had been removed. Latency was not affected. Both species spent approximate the same percentage of time consuming fruits (~30%). Although sample size was to small for results to be significant, the degree to which spider monkey consumption benefits fruiting trees appears to exceed that of howler monkeys.

Keywords: seed dispersal, mantled howler monkey, *Alouatta palliata,* black-handed spider monkey, *Ateles geoffroyi*

Email: mspalmer@owu.edu

Podium Presentation:

Cortical brain development in capuchin monkeys (*Cebus apella*)

Kimberley A. Phillips & Chet C. Sherwood

Departments of Psychology and Biology, Hiram College; Department of Anthropology, The George Washington University.

Relative to other primates, *Cebus* monkeys display unusually fast postnatal brain growth and motor skill development. The neonatal capuchin brain, at approximately 29-34 g, is a smaller proportion of the adult brain weight (*c.* 50%) than is the brain of other primates except humans and great apes. Here we describe, from a cross-sectional sample, brain development in 29 brown capuchin monkeys (*Cebus apella*) using high-resolution structural magnetic resonance images, focusing on growth patterns in total brain volume, cortical gray and white matter volume, frontal lobe gray and white matter volume, and corpus callosum area. Non-linear age-related changes in total brain volume, cortical white matter volume and frontal white matter volume were detected from birth – 5 years. Sex differences in corpus callosum:brain ratio were also found, with males having a 10% smaller corpus callosum:brain ratio than females regardless of age. Female corpus callosum:brain ratio showed significant age-related related changes, whereas males did not display any significant changes across age. Sex differences were also found in cortical gray and frontal lobe gray matter volumes, with males having larger volumes

than females. These findings support the conclusion that capuchins undergo rapid neurological change during the first few years of life.

Keywords: brain development, frontal lobe, *Cebus*, corpus callosum

Poster Presentation:

Brain structures differ among tool using and non-tool using capuchin monkeys

Kimberley A. Phillips[1], Courtney A. Sobieski[1], Claudia R. Thompson[2] & Chet C. Sherwood[3]

[1]Departments of Psychology and Biology, Hiram College; [2]Department of Psychology, The College of Wooster; [3]Department of Anthropology, The George Washington University.

In humans, structural brain differences are associated with gender, handedness, and learned motor skills such as musical performance. With professional keyboard players, differences have been reported in various regions of the brain, including the corpus callosum, motor cortex, and cerebellum. Here we investigate whether tool using and non-tool using adult capuchin monkeys (*Cebus apella*) exhibit neuroanatomical differences due to their high degree of manipulative propensities and extractive foraging habits. Tool using monkeys demonstrated proficiency in tool manipulation to retrieve a reward whereas non-tool using monkeys were never exposed to a tool or did not demonstrate learning of the task. High resolution 3T MRI scans were obtained for each subject and total brain volume, corpus callosum, and cerebellum were traced using an ROI approach. Tool using monkeys (n=9) had larger CC: brain ratios and anterior portions of the CC: brain ratios than non-tool using monkeys (n=9). Cerebellar volume (relative to total brain volume) was 11% larger in tool using monkeys. These results show that tool using monkeys demonstrate volumetric increases in regions of the brain that are consistent with those seen in musicians. We propose that these neuroanatomical differences represent plasticity to the motor demands of tool use, and may reflect structural changes in response to long-term motor skill training.

Keywords: *Cebus*, neuroanatomy, tool use

Podium Presentation:

Provisioning by savanna chimpanzees (*Pan troglodytes verus*) at Fongoli, Senegal.

J.D. Pruetz[1] and S.M. Lindshield[2,1]

[1]Department of Anthropology, Iowa State University, Ames, IA and
[2]Ecology Evolutionary Biology Program, Iowa State University, Ames, IA.

Provisioning, such as transferring food between mates, offspring or other group members, is uncommon among most nonhuman primate species but is considered by some as a defining characteristic of humans. When provisioning does occur in nonhuman animals, the giver is generally thought to gain immediate or delayed benefits. Within the great apes, provisioning or food sharing usually occurs between mother and offspring. In chimpanzees, meat sharing among nonrelatives is common, but plant food sharing is rare. At Fongoli, Senegal, chimpanzee males have been observed to provision females and, in terms of meat sharing, dominant individuals do not commonly monopolize carcasses. Here we provide preliminary data on instances where male chimpanzees shared plant foods with an unrelated anestrous adult female and, on other occasions, provided tools for her. In successful hunting cases, both males and females shared meat, with hunters commonly retaining control of their carcass. The question is why such a pattern of food sharing and tool provisioning occurs at Fongoli when it is uncommon for chimpanzees in general. We explore various explanations for this unusual behavior and examine these instances of affiliative sharing in terms of their implications for the evolutionary origins of sharing and altruism in humans.

Keywords: Chimpanzee, sharing, altruism, savanna, *Pan troglodytes verus*

Poster Presentation:

Variation in parental care in the hylobatids: species comparisons of the role of hormones in paternal care

Michelle L. Rafacz, University of Chicago/Lincoln Park Zoo

Gibbons and siamangs are unique among the hylobatids, exhibiting monogamy, bi-parental care, and varying degrees of paternal care across species. However, little is known about the role of hormones, environment, and individual experience in variation in reproduction and parental care. Siamangs are the only hylobatids in which males show direct care in the form of infant carrying, while gibbons show indirect paternal care in the form of protection (Dielentheis et al 1991). Great variation in the quality of maternal care has also been observed in captive gibbons and siamangs over the past 20-30 years, ranging from appropriate (ie, high responsiveness to infants) to inadequate (ie, abusiveness, neglect, over-grooming), often resulting in hand-rearing and sometimes fatality. Determining factors contributing to variation is imperative because of the negative consequences hand-rearing can have on future reproductive success (J. Petersen, pers comm 2006). For the purposes of this poster, I will use hormonal and behavioral data collected and analyzed from five gibbon and siamang males during pregnancy and post-partum to compare patterns across species to elucidate differences contributing to the degree of paternal care in captive hylobatids.

Keywords: Hylobatidae, paternal care, hormones and behavior

Podium Presentation:

Seasonal influences on the weaning process in mantled howler monkeys (*Alouatta palliata*) at La Isla de Ometepe, Nicaragua.

Melissa Raguet-Schofield, University of Illinois at Urbana-Champaign

Transitioning to dietary independence can be risky for mammalian juveniles. An extended mixed-feeding phase (juveniles continue nursing but also feed independently) may reduce the mother's energetic demands while still providing the juvenile with nutrients. This research hypothesizes that juvenile mantled howler monkeys rely on their mothers' milk as a "fallback food" during periods of resource scarcity. This hypothesis predicts that, as resources become scarce during the dry season, howlers shift their diets. Juveniles are expected to forage less efficiently than adults, continue nursing while resources are scarce, and have increased mortality. Data to test this hypothesis were collected on Ometepe Island, Nicaragua, from August 2006 through August 2007. Results indicate reduced food availability during the dry season. Howlers shifted to a diet high in flowers but low in protein sources, such as young leaves. Additionally, juveniles foraged significantly less efficiently than adults. Despite continued nursing during the dry season, juveniles experienced higher mortality than any other age/sex class. The evolution of an extended mixed-feeding phase enables juveniles to fall back on their mothers' milk during the scarce dry season. This research demonstrates the importance fallback foods in life history evolution, including the pace of development and level maternal investment.

Keywords: life history, weaning, juvenile mortality, seasonality, fallback food

Email: raguet@illinois.edu

Poster Presentation:

Not only the lonely: Solitary play in juvenile spider monkeys (*Ateles geoffroyi)*

Michelle A. Rodrigues, Department of Anthropology, The Ohio State University

Play behavior is hypothesized to serve a variety of functions, but can generally be limited to two general purposes: to refine motor development, and to achieve social competency. The importance of such functions can be evaluated by comparing patterns of solitary play in relation to social play. While social play is shaped by dispersal patterns and social structure, solitary play should reflect developmental needs. However, if social opportunities are limited, factors of social structure may also influence solitary play patterns. In this study, I report on patterns of solitary versus social play in wild juvenile spider monkeys at El Zota Biological Field Station, Costa Rica. Based on *Ateles* social structure and developmental patterns, I hypothesized that females would engage in

solitary play more often males, and that younger juveniles would engage in greater amounts of solitary play. However, both of these hypotheses were rejected. Although differences in age and sex affect rates of social play, solitary play was constant across these variables. These results suggest that the motor development hypothesis does not provide an adequate explanation for why juvenile engage in solitary play. Furthermore, solitary play cannot be considered compensation for lack of opportunities to engage in social play.

Keywords: play, juveniles, *Ateles*, development

Email: rodrigues.11@osu.edu

Podium Presentation:

The characterization of affiliation and agonism in a ringtailed lemur (Lemur catta) social group

Gena Sbeglia,[1] Zuleyma Tang Martinez, [1] Robert W. Sussman[2]

[1]University of Missouri - St. Louis, [2]Washington University

The costs of sociality can threaten the integrity of a social group. The mechanisms proposed to explain how animals deal with the costs of group living point to aggression as being of primary importance in the maintenance of social organization and group cohesion. Using several basic yet commonly overlooked methods we test the hypothesis that affiliation is the more critical contributor to social organization and cohesion. Focal samples (350 hours total) were collected on seven ringtailed lemurs of a semi-free ranging group at Duke Lemur Center. We document affiliative and agonistic frequencies (distinguishing between active and passive interactions), intensity of aggression, context of interactions, interdependence of behavior modes, relationships between kinship and agonism and social impacts of a fight (post hoc reconciliation analysis). These measures will allow us to understand each individual's experience within its social group. Preliminary analyses suggest that individuals spend less time in agonism than affiliation. Furthermore, aggression is usually mild and does not occur primarily in feeding contexts where it is motivated by competition. Our data support the significance of affiliation in characterizing social organization and group cohesions and, if taken across taxa, can influence how we understand the evolution of sociality

Keywords: Sociality, affiliation, aggression, ringtailed lemurs

E-mail: gsbeglia@gmail.com

Poster Presentation:

Abundance estimates on the esoteric Angwantibo (*Arctocebus calabarensis*), in the Rhoko forest, Cross River State, Nigeria.

Schein L.[1], Nekaris K.A.I. [1], and Bearder S.K. [1]

[1]Oxford Brookes University, Nocturnal Primate Research Group, School of Social Sciences and Law, Oxford OX3 0BP United Kingdom

Due to their nocturnal behavior, dense habitats, and cryptic nature, baseline data are lacking for African lorises, preventing development of conservation action plans. The Calabar angwantibo (*Arctocebus calabarensis*) particularly remains a mystery: even its range parameters are unknown. Listed by IUCN as Least Concern, abundance data are becoming necessary as its habitat disappears and hunting pressures increase. To assess the effects of these threats, we studied angwantibos in Rhoko forest, Cross River State, Nigeria, a 400 ha secondary forest, actively protected by a community-based conservation program, CERCOPAN. From June-August 2008, we randomly selected and surveyed 15 transects to determine angwantibo abundance. Using DISTANCE, we applied a half normal cosine model to 29 angwantibo sightings. Analyses revealed detection probability of 0.66, effective strip width of 10.6m, yielding 0.13 animals per ha. This is the first study to quantify angwantibo abundance; these figures are in line with other low figures obtained for highly threatened Asian lorises. Vulnerable is a more appropriate listing for Rhoko when combined with interviews with hunters showing angwantibos to be a harvested meat source. More studies are needed to determine threat levels across the species' range, and to monitor the impact of hunting and deforestation on Rhoko angwantibos.

Keywords: Abundance, angwantibo, DISTANCE, loris, nocturnal surveys

Poster Presentation:

Response inhibition in capuchin monkeys

Katherine E. Schwan[1], Susan F. Folger[2], Nicole Trainer[1], Kimberley A. Phillips[1, 3] & Ryan D. Honomichl[1]

[1]Departments of Psychology, Hiram College; [2]Department of Psychology, University of Dayton; [3]Department of Biology, Hiram College.

Inhibition is defined as the ability to ignore or suppress thought processes or actions that are irrelevant to a goal. An inhibition task used across several species is the Object Retrieval (OR) task. The animal is presented with a clear Plexiglas box baited with a food reward. The presentation of the box is varied such that the location of the box opening varies across four locations: on top, in front, or on either side of the box. Once

the box is placed within reach of the animal, they often struggle to inhibit direct reaches towards the reward, regardless of the orientation of the box opening.

In the present study, we test four capuchin monkeys (*Cebus apella)* on the OR task over 8 sessions. We examined reach errors on front, top and side trials. Monkeys made more errors on the side trials (54%) than on top (16%) or front trials (4%). They also made errors more often when orientation was changed from front to side or top to side. Also, errors decreased on front and side trial types from the first four to the last four sessions (Front – 8% to 0%; Side - 66% to 42%). We suggest that this shows the difficulty in inhibiting a direct reach response, but that improvement on the task illustrates learning effects on inhibitory function.

Keywords: *Cebus*, inhibition, learning

Email: schwanke@my.hiram.edu

Poster Presentation:

Observing Stress in Captive Western Lowland Gorillas (*Gorilla gorilla gorilla*) through Behavioral Observations.

B.K. Smith, Doctoral Program Department of Anthropology, Purdue University

Gorillas have recently been listed as critically endangered on the IUCN Red List, vulnerable to hunting and disease and were historically difficult to maintain in captivity. Reproduction and living conditions for captive gorillas have improved over recent years but a large number of deaths among relatively young silverbacks have been linked to poor cardiac health. Stress has been directly linked to heart health problems in humans. Captive gorillas are exposed to different stressors than those they would encounter in the wild, including restricted movement, opportunities for inter-group interaction or dispersal, noise associated with captive environments, human visitors and construction. These stressors might potentially lead to poor health and well-being in captive individuals. This study examines the potential chronic stressors faced by gorillas in captivity and explores potential relationships between captivity and stress behaviors. In this study I investigate behavioral stress markers to examine possible relationships between captivity and stress among captive gorillas at the San Francisco Zoo. Behavioral data were collected on gorillas from June to August 2007. Overall, gorilla stress behaviors correlated with human activity. This suggests that gorillas are sensitive to the captive environment and certain management practices in zoos could be introduced to safeguard against potential stressors.

Keywords: stress, captivity, behavior, gorilla, zoo

Poster Presentation:

Contribution to New Forest Growth by A. palliata in a Fragment of Dry Tropical Forest

Angela Toole, University of Missouri-St. Louis

Research has shown that howler monkeys can be efficient seed dispersers. A preliminary study was conducted in June/July 2008 in a fragment of dry tropical forest on the Isla de Ometepe, Nicaragua to assess the potential contribution of *A. palliata* to seedling density and new forest growth. Using random 12 m^2 transects, I compared woody and herbaceous seedlings under 10 central activity trees to 10 control trees in which howlers were not active. Central activity trees were defined as trees in which monkeys were observed feeding and resting during the day rather than traveling through. Two-tailed independent sample t-tests were used to assess differences in new seedling growth between activity trees and control trees. There was a statistically significant difference (0.027 p-value) in the total number of seedlings between the groups, with activity trees having on average 96 more seedlings beneath them than control trees. There was also statistical significance (0.000 p-value) between the numbers of woody seedlings, with the activity trees having more. These results suggest that *A. palliata* may be important contributors to the variety and density of regenerating forests. Follow-up research is needed to examine biodiversity and to determine the effect of other seed-dispersing animals.

Keywords: ecology, seed dispersal, *Alouatta*

Email: atc3c@umsl.edu

Poster Presentation:

The ontogeny of the postcranial skeleton in two Neotropical primates (*Callimico goeldii* and *Saguinus fuscicollis*)

Bernardo Urbani , Department of Anthropology, University of Illinois at Urbana-Champaign

Ontogenetic studies of callitrichine anatomy are limited to research focused mainly on the adult postcranial skeleton. The goal of this study is to compare the ontogeny of postcranial skeletal development in Goeldi's monkeys (*Callimico goeldii*, hereafter referred to as callimicos) with data on saddle-back tamarins (*Saguinus fuscicollis*). The intermembral, humerofemoral, brachial, crural and ulna-radius indices of callimicos and saddle-back tamarins were calculated and compared among different age-classes in order to assess the implications for their ecology and behavior. Ontogenetic trajectories, including age at growth cessation also were calculated. It is shown that for a given hindlimb length, *S. fuscicollis* has longer forelimbs than *C. goeldii*, maintaining this

proportion across all age classes. In *S. fuscicollis*, relatively elongated forelimb may serve a mechanical role in reducing the force of impact when landing on large vertical substrates. In contrast, hindlimb length and pattern of hindlimb development (such as derived features of the ankle that enhanced stability) in callimicos appear to play a critical role in propulsion during trunk-to-trunk leaping. These differences may affect niche partitioning, foraging strategies, and substrate use.

Keywords: Growth, limb proportions, postcranial skeleton, allometry, New World primates.

Email: burbani@uiuc.edu; urbaniglobal@yahoo.com

Poster Presentation:

Association between social and environmental variables in a captive setting on computerized sequencing-task performance of zoo-living chimpanzees (*Pan troglodytes*) and gorillas (*Gorilla gorilla gorilla*).

Katherine E. Wagner and Stephen R. Ross

Lester E. Fisher Center for the Study and Conservation of Apes

In primates, environmental factors may exert long-lasting effects on general cognition and acute cognitive performance. These factors may become important when interpreting results of cognitive tests, in light of the range of facility types in which such work is conducted. Eight zoo-living chimpanzee and gorilla subjects were tested on a computerized sequencing task using a touch-frame interface. Subjects were maintained in naturalistic social and environmental settings, which included both natural reproductive cycles and facility-typical changes, such as alternations in staff. We analyzed performance on the task in relation to these variable factors. Performance by gorillas ($t=1.92$, $p=0.03$) – but not chimpanzees ($t=0.73$, $p=0.24$) –demonstrated a sensitivity to the identity of the human caretaker facilitating the test. Conversely, only chimpanzees exhibited sensitivity to female sexual receptivity (or proceptivity, for gorillas): all chimpanzees (males and females) achieved higher performance when their social groups contained fewer than two maximally tumescent females ($t=2.97$, $p=0.006$). Results indicate that ape performance on cognitive tests must be interpreted in the context of species-specific sensitivities to environmental and social profiles, including cyclical changes in management.

Keywords: Gorilla, Chimpanzee, Zoo-living, Cognition, Environmental factors

Email: kwagner@lpzoo.org

Podium Presentation:

Comprehension of Tool Properties in Orangutans (*Pongo* spp.)

Kristina R. Walkup[1,2], Robert W. Shumaker[1,2] and Jill Pruetz[2]

[1]Great Ape Trust of Iowa, Des Moines, Iowa
[2]Iowa State University, Ames Iowa

Comprehension of tool properties regarding rigidity and flexibility was explored in orangutans (*Pongo* spp.*)* through an extension of Povinelli, Reaux, and Theall's (2000) 'flimsy-tool' problem. Captive orangutans (*n*=3*)* were presented with three pairs of tools, with distinctly different properties, in separate trials to solve a problem in which a food reward was placed out of reach inside a transparent box. Solving the problem required selection of a rigid tool to open the box to access the reward. Each pair of tools contained one tool with rigid properties (a functional tool to solve the problem) and one tool with flimsy properties which when used would not lead to success. Unlike the chimpanzees of Povinelli et al.'s (2000) work, the orangutans were found to choose the functional, rigid tools significantly more than the non-functional, flimsy tools to solve the problem. Moreover, the orangutans demonstrated this within the first session, suggesting they had a comprehension of the properties of rigidity and flexibility and were able to apply this knowledge to the present task. The results of this study provide support that orangutans can recognize relevant tool properties, supporting comprehension of causal understanding regarding tools.

Keywords: Tool use, causal understanding, orangutan

Email:kwalkup@greatapetrust.org

Poster Presentation:

Thermoregulatory Behavior of Captive Colobus Monkeys (*Colobus guereza*)

Jason Wark

Department of Biology, Case Western Reserve University, Cleveland, OH
Conservation and Science, Cleveland Metroparks Zoo, Cleveland, OH

It has been previously shown that wild primates seek shade and display postures that confer a thermoregulatory advantage while under heat stress. These thermoregulatory strategies may be more significant for captive animals housed under non-native environmental conditions. The Cleveland Metroparks Zoo's (CMZ) Monkey Island exhibit houses a population of arboreal Old World primate—eastern black and white colobus (*Colobus guereza*). Contrary to their native habitat, Monkey Island features small artificial trees that offer few arboreal opportunities and little natural shade. These colobus face unique challenges such as high surface temperatures and intense sun

exposure. This study followed CMZ's population of seven colobus monkeys over six weeks from July to August, 2008. Behavioral observations were collected using focal, continuous sampling while environmental data was concurrently recorded using scan sampling. It was predicted that the colobus would display more open postures, such as lying supine and sitting with the legs extended, during observations with high surface and air temperatures. Furthermore, it is predicted that the colobus will seek shade on days with sparse cloud cover and high surface temperatures. This study aims to investigate the thermoregulatory behavior of an arboreal primate species living terrestrially.

Keywords: *Colobus guereza*, thermoregulation, posture

Email: Jason.wark@case.edu

Poster Presentation:

Effects of Tourism on the Behavior and Health of Red Howler Monkeys (*Alouatta seniculus)* in Suriname

Jessica Lynn Westin, Department of Classical Studies, Anthropology and Archaeology, The University of Akron

Ecological change caused by the implementation of tourism projects can impact nonhuman primates. In this project I assess the impact of tourism on the health and behavior of free-ranging red howler monkeys (*Alouatta seniculus*) in Suriname. I evaluated the health of subjects through observations of external indicators of poor health such as wounds, scars, and botfly lesions, and through the analysis of non-invasively collected feces. Fecal samples were analyzed for the presence of intestinal parasites. I also conducted behavioral observations to assay the effects of tourists on monkey behavioral patterns and responses to human activities. Results of this study suggest that monkeys living in areas of high tourist use altered their behaviors in response to tourism, while monkeys living in areas with little tourist presence responded more to specific disturbances imposed on them by the tourists. Health parameters were not as strongly affected by tourist presence, though in general, monkeys in areas of high tourist presence suffered slightly poorer health than other monkeys. These results contribute to our understanding of how nonhuman primates respond to human actions, and have important implications for conservation and tourism programs in tropical forests.

Keywords: Tourism impact, red howler monkeys, fecal analysis, Suriname

Email: jlw110@uakron.edu

Poster Presentation:

Sex Differences in Mantled Howler Monkey (*Alouatta palliata)* Feeding Diversity in Two Dry Tropical Forest Fragments

Kimberly Wilbanks, University of Missouri-St. Louis

Female primates adapt their diets to compensate for the increased energy requirements of pregnancy and lactation. I hypothesized that adult female mantled howler monkeys would exploit a wider variety of plant species than males in order to compensate for their increased nutritional demands. Research was conducted at Ometepe Biological Research Station, Nicaragua in two dry tropical forest fragments. Approximately 50 hours of data were collected from June 26-July 10, 2008. The study population consisted of adult monkeys living in two distinct groups. Continuous focal animal sampling was used to assess activity and plants consumed. A Chi-square test was conducted comparing plant species exploited by males and females. Results indicated that females did not feed from a significantly greater variety of plant species than males (X^2=5.13, p=0.40). These results suggest that the female monkeys in these two groups may meet their energetic needs through other means, such as increasing the rate and overall time spent feeding. Results differ from groups living in contiguous forests, which may mean special adaptations have developed which help mantled howlers adapt to living in forest fragments. Future studies should assess feeding durations and nutritional analyses of plant foods between monkeys living in contiguous and fragmented forests.

Keywords: Sex differences, feeding ecology, reproductive ecology, forest fragments, feeding diversity

Email: K.L.Wilbanks@umsl.edu

Podium Presentation:

The Influence of Arboreality on Longevity in Mammals.

Scott A. Williams and Milena R. Shattuck

Department of Anthropology, University of Illinois, Urbana-Champaign

The evolutionary theory of aging predicts that organisms increase maximal lifespan by reducing extrinsic mortality rate, which exposes late-acting deleterious mutations to selection, ensuring that future generations will experience delayed senescence and longer maximal lifespans. At common body sizes, birds, bats, and gliding mammals possess longer maximal lifespans than non-volant, non-gliding mammals, presumably because of reduced predation. It has been suggested that arboreality reduces extrinsic mortality, thus slowing senescence and increasing maximal lifespan. We test this hypothesis by analyzing a large dataset of lifespan records for 520

species of eutherian mammals. We show that, overall, arboreal mammals have significantly longer maximal lifespans than terrestrial mammals at common body sizes ($p<0.001$). This result holds true for every subclade of Eutheria in which comparable numbers of arboreal and terrestrial taxa exist. Because only humans have become fully terrestrial, a meaningful comparison among primates is not possible. However, when the remaining primates are assigned to arboreal and semi-arboreal categories, there is no significant difference between the two subgroups in terms of maximal lifespan. An arboreal evolutionary history may allow for increased longevity in all primates. Alternatively, primates may demonstrate a unique model of increased longevity, perhaps in relation to increased brain size, that is independent of their habitat type.

Keywords: longevity, senescence, arboreality, mammals

Email: swilli38@uiuc.edu
Email: mshattu2@uiuc.edu