



# The 11th International Symposium on Primateology and Wildlife Science

Date: 1<sup>st</sup> (FRI)-3<sup>rd</sup> (SUN), March, 2019

Venue: Science Seminar House,  
North Campus, Kyoto University



## The 11th International Symposium on Primatology and Wildlife Science

	1st March (Fri)	2nd March (Sat)	3rd March (Sun)
9:00-		<b>From Field to Laboratory</b>	<b>Wildlife Studies in Brazil</b>
		(Chair: Andrew MacIntosh)	(Chair: Shiro Kohshima)
9:30-		[15 min] × 4	[40 min] Shiro Kohshima
		Josue Pastrana, Himani Nautiyal,	[30 min] Takakazu Yumoto
10:00-		Shintaro Ishizuka, Xiaochan Yan	[15 min] Tsuneaki Yabe
		[30 min] Susumu Tomiya	[15 min] Daisuke Muramatsu
10:30-		<b>Coffee Break</b>	
		<b>Ecology and Sociology</b>	<b>Coffee Break</b>
11:00-		(Chair: Yuta Shintaku)	[40 min] Karen Strier
		[15 min] × 4	
11:30-		Maegan Fitzgerald, Liu Jie, Shohei Shibata, Raquel Costa	
		<b>Lunch Break</b>	<b>Environmental Enrichment</b>
12:00-	<b>Registration Open</b>		[15 min] Yumi Yamanashi
			<b>Closing remarks by Prof. Matsuzawa</b>
12:30-			<b>PWS Faculty meeting</b>
13:00-	<b>Opening remarks by Prof. Matsuzawa</b>	<b>Equinology</b>	
	Equinology: A case from Primatology to Wildlife Science	(Chair: Satoshi Hirata)	
13:30-	<b>Comparative Cognitive Science</b>	[15 min] × 5	
	(Chair: Yuko Hattori)	Shinya Yamamoto, Monami Ringhofer,	
14:00-	[40 min] Christain Rutz	Tamao Maeda, Pandora Pinto, Sota Inoue	<b>Buddha seminar (Ministry of the Environment)</b>
	[15 min] × 4	[15 min] Renata Medonca	Seiko Fukushima
14:30-	Shenwen Xu, Hiroya Takiyama,	[40 min] Francisco Alvares	Yuko Tawa
	Yuri Kawaguchi, Morgane Allanic		
15:00-			<b>Organizing Committee of the ICEE2019</b>
	<b>Coffee Break</b>	<b>Group Photo</b>	
15:30-		<b>Coffee Break</b>	
	<b>Wildlife Genomics</b>	[40 min] Yuki Konagaya	
16:00-	(Chair: Takashi Hayakawa)	[40 min] Carlos Pereira	
	[40 min] Rebecca Johnson	[15 min] × 3	
16:30-	[15 min] × 3	Masaki Tomonaga, Sakiho Ochi, Miho Murayama	
	Takashi Hayakawa, Takushi Kishida, Yu Sato		
17:00-			
	<b>Sustainable Development Goals</b>		
17:30-	[30 min] Masahiko Horie (Chair: Lira Yu)		
	<b>Poster session/PWS entrance examinations</b>	<b>Poster session/PWS entrance examinations</b>	
18:00-		(voting for Best Oral and Poster presentations will be closed)	
18:30-			
		<b>Get-together party (light meal)</b>	
19:00-			

# The 11th International Symposium on Primatology and Wildlife Science

## PROGRAM

### Day 1 March 1st (Fri)

Time		(min)	Title	Speaker	Affiliation
12:00-13:00			Registration		
13:00-13:30		(30)	Opening Remarks Equinology: A case from Primatology to Wildlife Science	Tetsuro Matsuzawa	PWS Program Coordinator
			Comparative Cognitive Science		
			Chair: Yuko Hattori		
13:30-15:15	O-01	(40)	Tool use in New Caledonian and Hawaiian crows	Christain Rutz	University of St Andrews
	O-02	(15)	A research plan for chimpanzees' understanding of video images	Shenwen Xu	Primate Research Institute, Kyoto University
	O-03	(15)	The difference of important frequency area for perception between chimpanzees and humans to discriminate sounds	Hiroya Takiyama	Primate Research Institute, Kyoto University
	O-04	(15)	Progress report on the cross-cultural comparisons of face images	Yuri Kawaguchi	Primate Research Institute, Kyoto University
	O-05	(15)	Social grooming in captive and wild <i>Pan</i> species	Morgane Allanic	Primate Research Institute, Kyoto University
		(30)	<Coffee Break>		
			Wildlife Genomics		
			Chair: Takashi Hayakawa		
15:40-17:05	O-06	(40)	Wildlife genomics and conservation – lessons from the koala genome	Rebecca Johnson	Australian Museum
	O-07	(15)	Life slowly, life in the dark – insight from slow loris genome	Takashi Hayakawa	Japan Monkey Centre / PRI
	O-08	(15)	Genomic basis of the evolution of olfaction on becoming aquatic	Takushi Kishida	Wildlife Research Center, Kyoto University
	O-09	(15)	Population genomics revealed the history of endangered Japanese golden eagle	Yu Sato	Wildlife Research Center, Kyoto University
			Sustainable Development Goals		
			Chair: Lira Yu		
17:05-17:35	O-10	(30)	The Planet, Humans and SDGs	Masahiko Horie	Meiji University
17:35-18:40			Poster session/ PWS exam		

## Day 2 March 2nd (Sat)

Time		(min)	Title	Speaker	Affiliation
			From Field to Laboratory	Chair: Andrew MacIntosh	
9:00-10:30	O-11	(15)	Final Report: Effects of enriched captive environments in two primate species; <i>Macaca fuscata</i> and <i>Nycticebus pygmaeus</i>	Josue Pastrana	Primate Research Institute, Kyoto University
	O-12	(15)	Elucidating the social system and reproductive strategies of Central Himalayan langurs ( <i>Semnopithecus schistaceus</i> ) in a high-altitude forest of the Western Himalayas, India	Himani Nautiyal	Primate Research Institute, Kyoto University
	O-13	(15)	Comparison of male genetic differentiation between groups in the genus <i>Pan</i>	Shintaro Ishizuka	Primate Research Institute, Kyoto University
	O-14	(15)	Characterization of bitter taste sensitivity of four species of Sulawesi macaques	Xiaochan Yan	Primate Research Institute, Kyoto University
	O-15	(30)	Paleontological insights into the state of modern biodiversity: from Natural Trap Cave (Wyoming, USA) and beyond	Susumu Tomiya	Primate Research Institute, Kyoto University
		(15)	<Coffee Break>		
			Ecology and Sociology	Chair: Yuta Shintaku	
10:45-11:45	O-16	(15)	Living in the Midst of Nimba	Maegan Fitzgerald	Wildlife Research Center, Kyoto University
	O-17	(15)	Modeling Habitat Suitability for Yunnan Snub-nosed Monkeys in Laojun Mountain National Park	Jie Liu	Wildlife Research Center, Kyoto University
	O-18	(15)	Fission and Aggression among Male Chimpanzees in Kalinzu Forest Reserve, Republic of Uganda	Shohei Shibata	Primate Research Institute, Kyoto University
	O-19	(15)	Assessment of the current impact of mountain gorilla ecotourism in Bwindi National Park, Uganda	Raquel Costa	Primate Research Institute, Kyoto University
11:45–13:00		(75)	<Lunch Break>		
			Equinology	Chair: Satoshi Hirata	
13:00-15:10	O-20	(15)	Development of Equinology: divergent approaches from physiology to community science	Shinya Yamamoto	Institute for Advanced Study, Kyoto University
	O-21	(15)	Mechanisms of herding to maintaining cohesiveness of harem group: different reaction of females toward the male and other females	Monamie Ringhofer	Institute for Advanced Study, Kyoto University
	O-22	(15)	Multi-level structure in feral horse society: Evidence from the aerial observation from drones	Tamao Maeda	Wildlife Research Center, Kyoto University
	O-23	(15)	Does size matter? Examining the possible mechanisms and adaptive significance of single and multi-male groups in Horse societies	Pandora Pinto	Wildlife Research Center, Kyoto University
	O-24	(15)	Estimation of force working among individuals in feral horses	Sota Inoue	Wildlife Research Center, Kyoto University
	O-25	(15)	Investigating the causes and consequences of feral horses' disappearance and juvenile mortality in North of Portugal	Renata Mendoca	Primate Research Institute, Kyoto University
	O-26	(40)	Free-ranging horses and Iberian wolves: ecological context and conflict management	Francisco Alvares	Porto University
		(10)	<Group Photo>		
		(15)	<Coffee Break>		
15:35-17:40	O-27	(40)	Mongolian Life with Horses	Yuki Konagaya	National Museum of Ethnology
	O-28	(40)	HORSE TRAINING: Towards a description of a man-animal interspecific haptic syntax: the case of man-horse ( <i>Equus caballus</i> ) haptic communication	Carlos Pereira	Paris III Sorbonne Nouvelle
	O-29	(15)	How Horses See the World: Five Years of Endeavor of Horse Cognition Project	Masaki Tomonaga	Primate Research Institute, Kyoto University
	O-30	(15)	Preliminary assessment of new machine learning model for extracting and analyzing horse vocalization	Sakiho Ochi	Wildlife Research Center, Kyoto University
	O-31	(15)	Molecular markers for domestication history of the horse	Miho Murayama	Wildlife Research Center, Kyoto University
17:40-18:40			Poster session/ PWS exam		
18:40–			Get-together Party (light meal)		

### Day 3 March 3rd (Sun)

Time		(min)	Title	Speaker	Affiliation
			Wildlife Studies in Brazil	Chair: Shiro Koshima	
9:00-10:40	O-32	(40)	"Field Museum" project in Amazon	Shiro Koshima	Wildlife Research Center, Kyoto University
	O-33	(30)	Characteristics of Tropical Forests in South America -Special Mentions on Seed-dispersal by Animals-	Takakazu Yumoto	Primate Research Institute, Kyoto University
	O-34	(15)	Animal research of SATREPS 'Museu na Floresta' in Cuieiras Biological Reserve, INPA, Brazil	Tsuneaki Yabe	Forestry and Forest Products Research Institute
	O-35	(15)	Monitoring the activity and thermoregulation of wild three-toed sloths by using heart-rate, temperature, and GPS loggers	Daisuke Muramatsu	Wildlife Research Center, Kyoto University
		(20)	<Coffee Break>		
11:00-11:40	O-36	(40)	Comparative Perspectives on Behavior Patterns and Plasticity: What the Northern Muriqui can Teach us About Apes and Other Primates	Karen Strier	University of Wisconsin-Madison
			Environmental Enrichment	Chair: Yumi Yamanashi	
11:40-11:55	O-37	(15)	Invitation to the 14th International Conference on Environmental Enrichment	Yumi Yamanashi	Kyoto City Zoo
11:55-12:05		(10)	Closing remarks	Tetsuro Matsuzawa	PWS Program Coordinator
12:05-			PWS Faculty meeting		

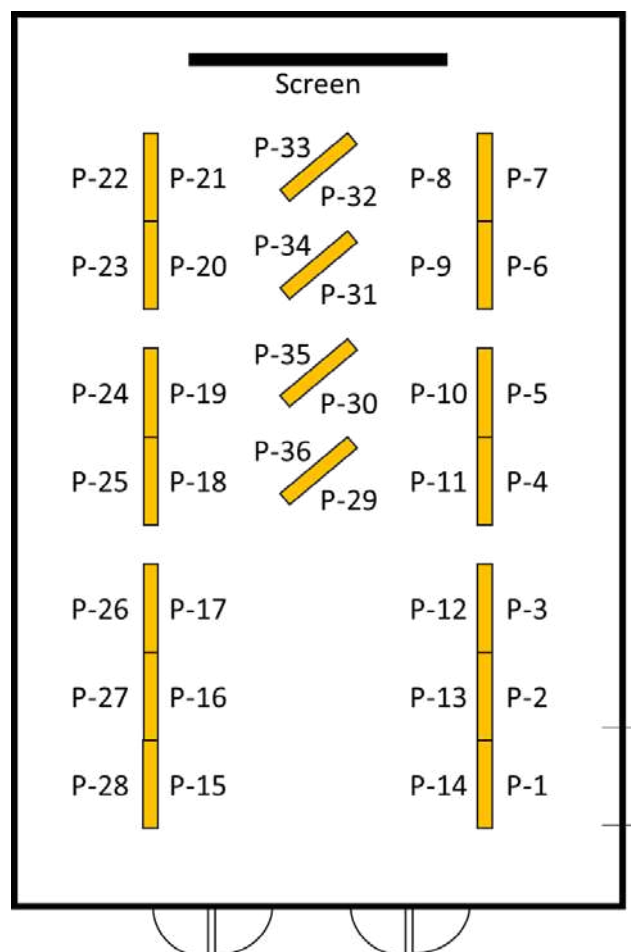
14:00-15:00	<p><b>Buddha seminar</b>  <b>Park ranger of Ministry of the Environment</b>  Speaker: Seiko Fukushima, Yuko Tawa</p>				
15:00-16:00	<p><b>Organizing Committee of the ICEE2019</b></p>				

## Poster Session

P-01	Yutaro Sato	A cross-modal preferential looking experiment in chimpanzees
P-02	Gerard James Brooks	Self-domestication, Groupmindedness, and the Evolution of Cooperation: Comparative Studies with Coyotes, Bonobos, and Chimpanzees
P-03	Catia Correia Caeiro	Cross-species FACS review and a new muscle-based coding system to measure Japanese macaques and Common marmosets facial movements
P-04	Duncan Wilson	Visual discrimination of threatening faces in chimpanzees
P-05	Srishti Tripathi	Emotional conflict monitoring and adaptation: An ERP study based on the face-word stroop task
P-06	Kristin Haverkamp	A longitudinal investigation into captive chimpanzee sleeping behavior
P-07	Mikuho Yokoyama	Constancy of perception and memory of texture under real world illuminations
P-08	Surdensteeve Peter	The Prevalence of <i>Cryptosporidium</i> spp and <i>Giardia</i> spp infection in Long tailed Macaque ( <i>Macaca fascicularis</i> ) and Proboscis Monkey ( <i>Nasalis larvatus</i> ) in the Lower Kinabatangan Floodplain
P-09	Yuta Shintaku	Comparison of internal organ weight among generations in captive Japanese Yaku macaques, <i>Macaca fuscata yakui</i>
P-10	Vanessa Gris Nadine	Pain Management and Anesthesia in Japanese Macaques
P-11	Nelson Broche	Salivary alpha-amylase enzyme is a biomarker of acute stress in Japanese macaques ( <i>Macaca fuscata</i> )
P-12	Rashmi Singh Rana	Understanding disease transmission potential between wild ungulates and domestic livestock in the Indian Trans-Himalayan region:
P-13	Yusuke Hori	Analysis of arginine-vasopressin receptor gene (AVPR1A) in Hokkaido horses
P-14	Howard Scott Jenkins	Identifying active tameness regions in wild and domestic grasscutters ( <i>Thryonomys Swinderianus</i> )

P-15	Nobuko Nakazawa	Dietary adaptation of leopards in Mahale, Tanzania.
P-16	Hiroto Yoshimura	Plant eating habit of captive snow leopards ( <i>Panthera uncia</i> )
P-17	Nachiketha Sharma	Insights on low-frequency (rumbles) vocalizations in free-ranging Asian elephants
P-18	Moe Yanagi	The diet and distribution of the elephants in the Kibale National Park, Republic of Uganda
P-19	Mayuko Nomoto	Diet of forest elephants by fecal analysis at Moukalaba, Gabon: Does body size matter?
P-20	Mi Yeon Kim	Whistle characteristic of wild Indo-Pacific Bottlenose dolphins ( <i>Tursiops aduncus</i> ) in Jeju Island, Republic of Korea
P-21	Chisato Yamamoto	How bottlenose dolphins used human competitor cues?
P-22	Huiyuan Qi	Investigation about the teenagers' attitude towards the problem of free-roaming cats in Tokunoshima with the use of Structural Equation Modelling (SEM)
P-23	Tamaki Shimegi	Community-based Conservation and Forest Management in Masindi District, Uganda: Preliminary Observation Using Camera Traps
P-24	Ryoma Otsuka	Understanding Community People's Perception of Animals Living in Protected Areas: A Case of Bwindi Impenetrable National Park, Uganda
P-25	Aya Yokotsuka	Consumption of Bonobo meat among Bongando ethnic group in DR Congo
P-26	Kentaro Noda	Establishment of National Park and Changes in Feeding Behavior of Zanzibar Red Colobus ( <i>Procolobus kirkii</i> )
P-27	Cécile Sarabian	Conservation through disgust and public health: Introducing a new framework
P-28	Momoko Oka	A visitor survey at the Kyoto City Zoo : Does environmental enrichment facilitate visitors' learning?
P-29	Annegret Moto Naito	Genetic monitoring of the Japanese golden eagle using neutral and functional genetic loci

P-30	Yuto Taki	Conservation genetics for the Ryukyu flying fox
P-31	Noor Haliza Hasan	Cryptic species in <i>Hipposideros diadema</i> (Chiroptera: Hipposideridae) from Sabah, Malaysian-Borneo
P-32	Ena Onishi	The Social Relationships of Breeding Pairs in Monogamous Groups of Captive Common Marmosets ( <i>Callithrix jacchus</i> )
P-33	Tomoyuki Tajima	Can female orangutans estimate male's coercive tendency by engaging intersexual food transfer?
P-34	Jie Gao	The understanding of body structures in chimpanzees: conspecifics and other species
P-35	Tomoe Torii	Aging Characteristics of Permanent Teeth in Chimpanzee
P-36	Fabrizio Serrao	Effects of psilocybin on connectivity during the processing of an optic illusion



## **Tool use in New Caledonian and Hawaiian crows**

Christian Rutz<sup>1\*</sup>

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New Caledonian crows have attracted attention with their unusually sophisticated tool behaviour. They use at least three distinct tool types for extractive foraging, elaborately craft some of their tools from raw plant materials, and may even progressively refine their tool designs across generations, leading to ever more complex technologies. In this talk, I will take stock of my group's research on the species over the past 14 years, highlighting aspects of foraging ecology, tool-manufacture behaviour, social dynamics, and morphological adaptations. Building on our growing understanding of New Caledonian crow biology, I have recently made predictions about the tool competence of other corvids, leading to the discovery that the critically-endangered Hawaiian crow is also a highly-dexterous, natural tool user (Rutz *et al.* 2016, *Nature* 537, 403–407). This opens up exciting opportunities for replicated comparisons between tool-using and non-tool-using crow species, and more importantly, between the corvid and primate lineages.

## **A research plan for chimpanzees' understanding of video images**

Shenwen Xu<sup>1\*</sup>, Masaki Tomonaga<sup>1</sup>

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Movement information, especially about competitors or companions who share the same resource, is crucial for behavioural decisions. As a result, animal visual systems are adapted to perceive moving stimuli using sight. In order to precisely estimate the way animals process information in response to the changing situations, it is required to use experimental tests under a highly controlled setup. Previous studies found evidence that video images could be a useful tool to present stimulus in empirical investigation. However, whether subjects recognize a video, which reflects reality, as an image of real-world objects/events remain unclear. Since humans and chimpanzees (*Pan troglodytes*) largely share a similar visual system to process sensory events on the screen, in this study, we will investigate to what extent video displays can substitute for real stimuli in chimpanzees. In particular, we will examine whether the aid of a video image of a foraging related event would have the same effect as a live event to direct a chimpanzee's behaviour to successfully obtain a higher value food from dispersed food resources.

## **The difference of important frequency area for perception between chimpanzees and humans to discriminate sounds**

Hiroya Takiyama<sup>1\*</sup>, Yuko Hattori<sup>1</sup>, and Masaki Tomonaga<sup>1</sup>

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The ability of chimpanzees to distinguish conspecific vocalizations apart from other environmental sounds is important for communication signaling. In this study, we performed several experiments in order to reveal which frequency area can be discriminated by chimpanzees and humans. First, study participants were trained in correctly identifying localized chimpanzee sounds via left and right speakers and their respective push buttons. Second, both human and chimpanzee participants learned to discriminate between chimpanzee vocalizations (pant-grunt, pant-hoot, scream) and pure tone by selecting the corresponding speaker push button. Third, we applied a test condition to participants who passed the training, where filtered chimpanzee vocalizations (five low-pass filters and six high-pass filters) were compared to their ability to discriminate from pure tone. In order to analyze the importance of frequency area, we calculated the crossover frequency, which is where performance of high-passed sound and low-passed sound were the same. Crossover frequency is one measure of human speech that researchers have used to characterize the importance of various frequency regions in perception. Our results showed that the crossover frequency of chimpanzees (5 kHz) was higher than that of humans (2 kHz) by one octave, which suggests that chimpanzees use a higher frequency area for discriminating sounds than humans.

## **Progress report on the cross-cultural comparisons of face images**

Yuri Kawaguchi<sup>1\*</sup>, Masaki Tomonaga<sup>1</sup>

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Baby schema is a set of infantile features observed across many species including relatively large eyes, large forehead, small nose and mouth. Previous studies revealed that humans prefer those features. We have been investigated how much human recognition about infants is shared with apes. However, we are not sure even whether the way people recognize infants is universal across countries, given that previous human studies have been conducted almost exclusively in developed countries. It is possible that cultural background (e.g. exposed to cartoon characters with exaggerated baby schema) may affect the recognition. Therefore we decided to conduct cultural comparison study with human adult participants and investigated recognition of adult and infant face. Our pilot study was conducted in Malaysia. Participants were required to compose schematic adult and infant faces by choosing a face line and facial parts (eyes, nose and mouth) from multiple options and placing them on whiteboard. Our preliminary results show participants used smaller nose and mouth for infant faces compared with adult faces. On the other hand, bigger eyes for infant faces, which is one of the characteristic of baby schema were not observed. We will conduct the same study in people with other cultural backgrounds and compare the results.

## Social grooming in captive and wild *Pan* species

Morgane Allanic<sup>1\*</sup>, Misato Hayashi<sup>1</sup>, Masaki Tomonaga<sup>1</sup>, Takeshi Furuichi<sup>1</sup>, Satoshi Hirata<sup>2</sup>  
and Tetsuro Matsuzawa<sup>3</sup>

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Bonobos (*Pan paniscus*) and chimpanzees (*Pan troglodytes*) are genetically closely related and frequently interact through social grooming among themselves, yet they show strong differences in overall sociality. Bonobos show lower levels of aggression and higher rates of adult play compared to chimpanzees, illustrating a more peaceful and tolerant society. Moreover, bonobos are the only nonhuman primates that show frequent ventro-ventral sexual behaviors, which suggests that facial communication might play a more crucial role in their social interactions compared to chimpanzees. Both captive and wild *Pan* species use social grooming on a daily basis, and the aim of this study was to investigate whether the differences in *Pan* sociality are marked by differences in grooming patterns and to elucidate the role of environmental factors on grooming. To do so, we examined their body site and body orientation preferences (Study A) as well as their grooming reciprocity (Study B). Subjects were twelve captive chimpanzees and six captive bonobos from Kumamoto Sanctuary, Japan; seven wild chimpanzees from Bossou, Guinea; and fifteen wild bonobos from Wamba, DRC. Body sites, body orientation, bi-directional mutual grooming, and turn-taking were recorded using video clips of social grooming interactions. Results of Study A showed that bonobos faced each other and groomed the head and front areas more than chimpanzees, while the latter faced away and groomed the anogenital regions more, highlighting the importance of facial communication in bonobos compared to chimpanzees. In both species, wild individuals were found to face away and groom the back areas more than captive individuals. Preliminary results of Study B showed that while chimpanzees performed bi-directional (or simultaneous) mutual grooming, bonobos preferred to exchange roles and groom unidirectionally. In both species, captive individuals performed bi-directional mutual grooming more than wild individuals. Our findings indicate that body site and orientation preferences during social grooming as well as grooming reciprocity are influenced by social and environmental factors. This is the first study to systematically compare and analyze grooming interactions in both wild and captive *Pan* species.

## Wildlife genomics and conservation – lessons from the koala genome

Rebecca N. Johnson<sup>1\*</sup>

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Koalas are both biologically unique and evolutionarily distinct as the only living representative of the marsupial family Phascolarctidae. Koalas are increasingly vulnerable to the detrimental effects of population bottlenecks, disease, the loss of genetic diversity and climate change as increased urbanisation reduces habitat. As a result, koala populations are expected to decline across Australia by up to 50% over the next three generations (approx. 20 years) in the regions with the most genetically diverse animals but by contrast culling measures are likely in the southern parts of the distribution due to overcrowding and starvation, thus significant conservation intervention measures will be required.

The Koala Genome Consortium was established in 2013 with the collective aim to determine a way forward and steer their research towards ensuring the long-term survival of this important marsupial while simultaneously increasing Australia's genome sequencing capability (no *de novo* mammal genome had ever been sequenced and assembled by a solely Australian led group before). Rebecca will present an overview of the koala genome, including genomic insights gained into some of the koala's well known biological adaptations. She will also outline how the genome is now being used to inform conservation of koalas and what future outcomes the genome might offer.

## Life slowly, life in the dark – insight from slow loris genome

Takashi Hayakawa<sup>1,2\*</sup>, Shoji Tatsumoto<sup>3</sup>, Takushi Kishida<sup>4</sup>, Hikoyu Suzuki<sup>5</sup>, Hiroe Ishikawa<sup>3</sup>,  
Masato Nikaido<sup>6</sup> and Yasuhiro Go<sup>3</sup>

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Slow loris (genus *Nycticebus*) is a small-sized nocturnal strepsirrhine primate in the tropical Southeast Asia. In accordance with their name, slow loris has low basal metabolic rates. Slow loris ecology is also characterized by the insectivorous and gumnivorous trait, hibernation system, and venom production which is only observed among primates. This study is a challenge to the elucidation of these interesting ecology of slow lorises in terms of the whole genome sequencing. We generated a representative whole genome assembly of a male lesser slow loris (*N. pygmaeus*) using the high-molecular-weight genomic DNA purified from brainstem of the genetic specimen of Japan Monkey Centre. Linked-read sequencing by 10X Genomics Chromium Technology enabled the low-cost but high-quality genome assembly (scaffold N50 length = 18.4 Mbp). We also identified gene structures and gene expression levels based on RNA-seq data from 27 tissues of a female lesser slow loris.

We focused on the sensory evolution in the slow loris genome because previous study suggested that sensory trade-off between vision and olfaction occurred in nocturnal mammals and that insectivores have little reliance on bitter taste. We identified photoreceptor (*OPNs*), taste receptor (*TAS1Rs* and *TAS2Rs*), olfactory receptor (*ORs*), and vomeronasal receptor (*V1Rs* and *V2Rs*) gene repertoires. They were compared with other strepsirrhine primate genomes (a galago and two lemurs). For example, we found Lorisiformes-specific *TAS2R* expansion (i.e., lorises and galagoes), which might be related to their insectivorous and gumnivorous trait. As well as sensory receptors, we are going to analyze the gene structure and expression related to loris-specific ecology such as hibernation and venom and population dynamics based on the genome-wide nucleotide diversity. Slow loris currently encounters the deforestation and illegal trade problems and regarded as vulnerable or endangered species. The genomic information will contribute to the conservation of this small threatened animal.

## Genomic basis of the evolution of olfaction on becoming aquatic

Takushi Kishida<sup>1\*</sup>

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Marine amniotes belonging to various taxa provide an excellent opportunity for studying convergent evolution. Their sense of smell tends to be degenerated, though olfactory capabilities of aquatic amniotes remained largely elusive. In this talk, I will introduce my recent studies on comparative genomics of cetaceans and sea snakes in order to understand how their olfactory capabilities evolved upon aquatic adaptation. Both cetaceans and sea snakes reduced the sense of smell profoundly, but the remaining olfactory systems are different: Sea snakes can smell underwater using the vomeronasal olfactory system, while baleen whales smell in air using the main olfactory system. Toothed whales possess no nervous system structures that mediate olfaction. Underwater olfaction might also help whales survive in water more efficiently, but they have never acquired underwater-functional olfactory systems. Amniotes belonging to various taxa have independently undergone selective pressures upon aquatic adaptation. However, not only the ecological demands but phylogenetic backgrounds play important roles in the formation of sensory modalities in this process.

## Population genomics revealed the history of endangered Japanese golden eagle

Yu Sato<sup>1\*</sup>, Takushi Kishida<sup>1</sup>, Rob Ogden<sup>2</sup>, Miho Inoue-Murayama<sup>1</sup>

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Golden eagle (*Aquila chrysaetos*) has six subspecies widely distributed in the northern hemisphere. The population size of *A. c. canadensis* in North America is estimated about 32,000. More than 500 pairs of *A. c. chrysaetos* inhabit in Scotland, but this subspecies experienced strong bottleneck in UK in the beginning of 20<sup>th</sup> century. On the other hand, the population size of Japanese golden eagle (*A. c. Japonica*) in Japan is estimated around 500, and this subspecies has been concerned as the endangered subspecies. For conservation of this subspecies, it is essential to reveal the evolutionary history, current situation, and future perspective. Recently, it was become possible to reveal the historical effective population size ( $N_e$ ) with pairwise sequential Markovian coalescent (PSMC) model. This requires the genome data from one individual. We tried to analyze historical  $N_e$  of three golden eagle subspecies, and future perspective of endangered Japanese golden eagles.

The  $N_e$  of each golden eagle subspecies in 10 kya was estimated around 5,000. It was revealed that the tendency of population decline started from 0.1 Mya. However, in case of *A. c. canadensis*, current  $N_e$  has been estimated around 400 by previous research, and we found that the declining speed has been increasing from recent 10 ky. It is suggested that the endangered Japanese golden eagle might be faced more severe risk of extinction than previously imagined. The population size of this subspecies will probably decrease to extinction. Effective conservation management must be started as soon as possible.

## **“The Planet, Humans and SDGs”**

Ambassador Masahiko Horie  
*Special Assistant to the Foreign Minister of Japan*  
*Special Advisor to the President of Meiji University*

The Planet and Humans are at a crossroads. The world population is over 7 billion today and will be reaching 10 billion in the near future. We need to alleviate poverty by supporting over ten billion people in poverty for their economic development and many developing countries are endeavoring for their strong nation building, which in many cases leads to the global warming and further deterioration of environment and huge biodiversity loss.

At this lecture, we will review this conflict between Development and Environment including climate change and consider what we should do to save this Planet, Humans and Biodiversity by upholding the Sustainable Development Goals (SDGs) which was adopted at United Nations in 2015.

## Final Report: Effects of enriched captive environments in two primate species; *Macaca fuscata* and *Nycticebus pygmaeus*

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Primates are found in captivity under various kinds of conditions. Some are housed at zoos for entertainment and educational purposes. Others are housed at sanctuaries for conservation, while some are housed in research facilities to provide research support. Since improving captive environments for primates has been an important tool to enhance animal welfare, our research aimed to investigate the benefits in which living in an enriched environment decreases stress and promotes general animal well-being for macaques in research and lorises in zoo settings.

Understanding how current improvements to environmental captive conditions affect behavioral and physiological parameters in macaques is an important step to address any potential influence in ongoing research as well as to address any ethical and scientific concerns. We compared two groups of Japanese macaques living in a vegetated vs. a non-vegetated enclosure, the naturalistic vegetated enclosure was located at the Resource Research Station and the other group was housed in a non-vegetated enclosure at the Primate Research Institute. Activity budgets, rates of agonistic, affiliative, self-directed and abnormal behaviors, along with coat condition and fecal glucocorticoids for hormonal analysis were documented. In the enriched enclosure, individuals spent on average more time feeding than any other activity, and significantly more time feeding than males in the non-vegetated enclosure (Mann Whitney U=16, n1=10, n2=10, p=0.011). Time spent foraging was higher than in the non-vegetated enclosure (Mann Whitney U=19, n1=10, n2=10, p=0.020), while time spent moving had the opposite pattern (Mann Whitney U=17, n1=10, n2=10, p=0.013). The average time spent in social-play behaviors by immatures was significantly higher in the vegetated enclosure (Mann Whitney U=2, n1=5, n2=5, p=0.012). There was a significantly higher incidence of the number of aggressive events recorded in the non-vegetated enclosure ( $t = 4.1286$ ,  $df = 19$ ,  $P = 0.001$ ).

Contrastingly, pygmy slow lorises, known for being nocturnal solitary primates, are targets of various types of anthropogenic activities and in captivity they are mainly found in zoos or sanctuaries for educational and conservation purposes. Using similar parameters we used with our macaque project, we documented the transition of singly housed (0.3m<sup>3</sup>) lorises that were rescued from the illegal pet trade, into larger enriched social enclosure (16m<sup>3</sup>) at the Japan Monkey Center. We found that all individuals preferred to spend their time close to each other even when ample space to stay apart was available ( $X^2 = 18.0879$ ,  $df = 3$ ,  $p = 0.004$ ). Moving time decreased significantly in the enriched social housing condition ( $V = 0$ ,  $N = 6$ ,  $p = 0.03$ ), compared to the small caged condition, but no effect on other activities.

These results suggest that both species benefited from enriched enclosures in various ways. Future studies are needed to understand its long lasting effects for both research and ethical concerns. We hope our research will contribute to the increasing literature regarding animal welfare and conservation practices on primates.

**Elucidating the social system and reproductive strategies of Central Himalayan langurs (*Semnopithecus schistaceus*) in a high-altitude forest of the Western Himalayas, India**

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Indian Hanuman langurs are found in a variety of habitats ranging from the low altitude dry forests of Rajasthan to the high mountain oak forests of Himalayas. Along with their great ecological variation, they also exhibit striking variation in their social organization and mating strategies and this has proven to be of great importance for development in socio-ecological model. This study is the first to describe their reproductive behavior and dominance hierarchy in details. To do this, we first tested the effect of male's dominance rank and tenure (i.e. number of months that male has spent in the troop) on mating success. Then, we also investigated the effect of female's dominance rank, age and parity on mating frequency and the number of mating partners. From May to November 2017, we collected 1441 hours of observations on one troop of langurs. During the research, we collected male and female dyadic displacement interactions to assess their dominance hierarchy. To record their reproductive behavior, we used focal animal and sequence sampling methods. We calculated Pearson's product-moment correlation between male rank, tenure and their reproductive parameters. Female reproductive parameters were analyzed using a one-way ANOVA. Our data indicate that Central Himalayan langur male hierarchy is steeper than for other Colobine species reported so far. The study suggests that higher ranking males mated more frequently compared to lower ranking males, without the alpha male monopolizing females. However, we did not find any effect of female's dominance rank, age or parity on their mating frequency. Distributed mate choices in females may act as a strategy to confuse paternity, which could thus decrease the risk of infanticide. Long tenured males tended to get higher copulation rejection compared to newly immigrant males. One hypothesis to explain these results is that newly immigrant males represent genetic diversity whereas long tenured males may rather ensure infant protection. As such, females may have evolved certain mating strategies to balance between these two benefits.

## **Comparison of male genetic differentiation between groups in the genus *Pan***

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Bonobo and chimpanzee are the most closely related species with each other, and share many traits of social systems such as male philopatry. However, the antagonism towards males of different groups is largely different between the two species: chimpanzee males sometimes make lethal coalitionary attacks towards males of different groups, whereas bonobo males do not make such attacks. Given that male gene flow between groups seems more frequent in bonobos, this difference might be caused because male genetic differentiation between groups may be greater in chimpanzees than in bonobos. Here we estimated pairwise relatedness among male chimpanzees of two neighboring groups in the Kalinzu Central forest, and determined Y-chromosomal haplotypes of the chimpanzees and male bonobos of three neighboring groups in Wamba. From these results and data from previous studies, we compared male genetic differentiation between groups of the two species. Average relatedness value among male chimpanzees within groups was similar with that across groups. Autosomal and Y-chromosomal male genetic differentiation between groups of chimpanzees was not significantly higher than that of bonobos. These suggest that the differences in antagonism towards males of different groups between the two species cannot be explained by male genetic differentiation between groups.

## Characterization of bitter taste sensitivity of four species of Sulawesi macaques

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Sulawesi macaques have diverged into 7 species within a relatively short period and live allopatrically on Sulawesi Island, Indonesia. Thus, it will be interesting to study functional genes which might reveal species difference. Bitter taste plays a role in avoiding ingestion of toxins and resisting bacteria and parasites. We investigated a well-studied bitter taste gene, *TAS2R38*, receptor for the bitter glucosinolates in brassica vegetables and Phenylthiocarbamide (PTC). We studied PTC sensitivity and *TAS2R38* polymorphism in *M. hecki* (N: 16), *M. tonkeana* (N: 12), *M. nigrescens* (N: 11) and *M. nigra* (N: 15). Initially, we found behavior response on PTC varies between four species. All individuals of *M. hecki* are sensitive to PTC while some individuals of *M. tonkeana*, *M. nigra* and *M. nigrescens* are low sensitive. Determining *TAS2R38* sequence, we found low sensitivity of PTC was mediated by specific *TAS2R38* variants. In *M. tonkeana*, substitution on amino acid sites 117, 130 and 134 led to 'low sensitivity', whereas, in *M. nigrescens* and *M. nigra*, two base deletion and one base insertion respectively caused premature stop codon at site 85 and 178. Furthermore, we found these specific variations have independently arisen three times. Later we conducted cell-based functional analysis. We confirmed that the specific variants accurately predicted low PTC sensitivity in vitro. Interestingly, 'low sensitive' variants in *M. tonkeana* can express apparently intact *TAS2R38* receptor, with low response to PTC. The intact 'low sensitive' variants may respond to other bitter compounds. Additionally, the frequency of low-sensitive variants is 0.08, 0.33 and 0.54 in *M. nigrescens*, *M. nigra* and *M. tonkeana*, separately. We suggested high frequency of 'low sensitive' variants in *M. tonkeana* appeared in the root of divergence of Sulawesi macaques. Our findings revealed species difference on bitter taste; however, whether these differences were resulted from local adaptation need to be studied.

## **Paleontological insights into the state of modern biodiversity: from Natural Trap Cave (Wyoming, USA) and beyond**

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Natural Trap Cave (Wyoming, USA) has yielded a wealth of vertebrate fossils that offer a window on the faunal transition over the past ~30,000 years in the central Rocky Mountain region of North America. The fossil assemblage includes not only extinct elements of the Pleistocene megafauna but also their contemporary species that survived into the Holocene, helping us reconstruct phenotypic evolution within lineages leading to today. Such information provides evolutionary-historical context for understanding the state of modern biodiversity under human influence.

Here we present a case study of variations in the limb morphology of the gray wolf (*Canis lupus*) in time and space. With the focus on North America, our morphometric analyses of limb bones from the late Quaternary fossil sites, recent-historical times (before 1900AD), and more modern populations revealed that the species mainly consisted of short-legged forms across climatically-disparate regions (from Alaska to southwestern USA) during much of the last ~70,000 years and well into the Holocene. This pattern implies that late-Quaternary shifts in climate, first arrival of humans on the continent, and concomitant extinctions of large mammals had minor effects on the limb morphology of gray wolves. In contrast, extant populations in the Midwestern USA and northwestern North America exhibit markedly more elongate limb elements, which are suggestive of a more cursorial mode of life. These long-legged forms are not known in the North American fossil record, and their apparently-recent emergence coincides with a period of: (1) rapid persecution by humans; (2) decline of short-legged forms; and (3) near-extinction of the American bison—an important prey for the wolves. We hypothesize that overhunting of both the wolves and their prey effectively constituted strong artificial selection for longer limbs and precipitated an unprecedented shift in the ecomorphic composition of the wolves. Conservation of severely-diminished populations of short-legged forms is important for restoring the evolutionary trajectory of the species.

## **Living in the Midst of Nimba**

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As one of the last fragments of Upper Guinean forest remaining in Guinea, the Nimba mountain range is a high priority area for biodiversity conservation. It provides resources not only to many endemic animal and plant species, but also essential ecosystem services for thousands of people living within its midst. Acknowledging the need to reconcile sustainable use of resources and biodiversity conservation, the Nimba mountain range is classified as a UNESCO Man & Biosphere Reserve and World Heritage Site. This presentation aims to give a visual tour of the diversity of living species and the richness of resources and cultures present in the Nimba region, particularly in and around the southwestern portion of the mountain range.

## **Modeling Habitat Suitability for Yunnan Snub-nosed Monkeys in Laojun Mountain National Park**

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In this study, we provided new information on Yunnan snub-nosed monkey (*Rhinopithecus bieti*) behavioral ecology and contributed to future conservation efforts within the Laojun Mountain National Park. Habitat evaluation procedures are used to quantify the value of land as habitat for a species. We analyzed environmental variables hypothesized to influence habitat suitability for Yunnan snub-nosed monkeys, and mapped the distribution of suitable habitat across the study area and adjacent areas. Spatial analysis with GPS data was conducted to investigate home range change of these monkeys. Predictor variables were generated using ArcMap 10.5 (ESRI 2011) and R. We prepared 34 environmental variables at 30-m spatial resolution. Maxent 3.3.3 was used to analyze environmental variables that contributed to suitability. Using satellite remote sensing and GIS, we modeled the distribution of suitable habitat for Yunnan snub-nosed monkeys in the Jinsichang area of the Laojun Mountains in China. Habitat suitability was affected by several variables. The environmental variables that contributed most to habitat suitability, as determined by permutation importance, were mean diurnal range (31.6%), precipitation during the wettest quarter of the year (30.4%), average annual precipitation (17%), normalized difference vegetation index (5%), wetness (4.6%), and aspect (4.5%). This habitat suitability model provided important information about the potential current distribution of Yunnan snub-nosed monkeys that is essential for appropriate implementation of conservation actions.

## **Fission and Aggression among Male Chimpanzees in Kalinzu Forest Reserve, Republic of Uganda**

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Group living animals benefit by lessening predation risks, enhancing feeding efficiencies and increasing mating opportunities. However, they also face intragroup competition for food and reproductive resources. Therefore, individuals need to avoid or resolve such conflicts in order to maintain group living. In this study, we focused on how intragroup aggression among male chimpanzees relate to their fission-fusion dynamics.

From February to April and from June to September 2018, I conducted field works and observed male chimpanzees in M group at Kalinzu Forest Reserve, Uganda. We found that the number of males in a party were significantly larger in the presence of females showing maximum sexual swelling (MSS) than in the absence of females with MSS. In the absence of females with MSS, males tended to spend time alone or in small parties. Especially, lower-ranked males spent time alone more frequently than higher ranked males. Regardless of the absence/presence of females with MSS, the frequency of male aggressive behaviors increased along with increments of the number of males observed in the party. In addition, higher-ranked males showed more aggression than lower-ranked ones and lower-ranked ones received more aggression than higher-ranked ones. These results suggest that male chimpanzees have different levels of tendency to disperse in order to avoid the risk of intense aggression among males depending on their rank. This tendency might be one of the adaptive components which form fission tendency in chimpanzees.

## **Assessment of the current impact of mountain gorilla ecotourism in Bwindi National Park, Uganda**

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Ecotourism is an emergent and controversial topic in the field of wildlife management. Ecotourism plays a significant role in the conservation of mountain gorillas (*Gorilla beringei beringei*). Despite the growing number of tourists visiting mountain gorillas and an increasing number of habituated groups, very little behavioral data has been collected on the potential impacts of ecotourism on these wild populations. The present study examines how interactions with human tourists influence gorilla behaviour. For this study, we collected behavioural data (focal and scan sampling) before, during and after tourist visits over a 9-month period (December 2017-February, 2019) one habituated group (15 individuals) in Bwindi Impenetrable National Park, Uganda. Kruskal Wallis tests are used to compare pre-contact, contact and post-contact periods. Preliminary analysis shows that “Human directed behaviour” increases during the tourist visit and is present only when tourist are within 3 meters of the gorillas. Moreover, group social dynamics are affected by close distance to humans - affiliation, agonism and submission behaviours increase within 3 meters from the tourists. Further analysis is necessary, but the present results caution a disturbance in the gorilla’s behaviour related to the visit tourist. The problems are most pronounced when people get too close to the gorillas, in violation of standard rules.

## **Development of Equinology: divergent approaches from physiology to community science**

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We, the Kyoto University horse research team, have established equinology both in captivity and in the wild. This project covers a wide range of research fields: physiology, individual cognition, dyadic interaction with both conspecifics and interspecifics, group coordination, and inter-group relationship. These studies have a basis in the sophisticated research techniques and philosophy of primatology and comparative cognitive science. This established methodology, combined with some novel technology, enables us to explore the new frontier of animal science, and will hopefully yield fruitful insights on human evolution by means of comparisons between humans, non-human primates, and some other domesticated animals.

Here I introduce several recent and on-going studies with captive and wild horses. In captivity, we have succeeded in administering oxytocin to horses. Oxytocin is known as a “love hormone” or “trust hormone”, but recently it has been reported that oxytocin has some other functions in humans, such as inducing parochial bias and aggression toward outgroup members. We are testing how oxytocin affects horses’ interaction with conspecifics and humans, and also their group coordination and social network. This physiological study can directly compare horses with other domesticated species such as dogs and cats, as well as humans and non-human apes, which could give us insights about the evolution of society from the viewpoints of physiological mechanisms.

In the wild, we can investigate horse society with broader perspectives. In Serra d’Arga, Portugal, we have identified more than 25 groups of around 300 horses. We introduced a new methodology to observe the wild horses: aerial drones. With this newly developed technology, we can observe the animals from the air, which enables us to record precise location of all the individuals in the fields. We also established a new recording method: 30-min time sampling with drones. With this method, we can analyze the data quantitatively and track time-dependent changes. We succeeded in analyzing social networks among individuals within a group and also among groups in the whole community of the site (see Inoue et al. 2018 *Mammal Research*, and Maeda et al. presentation in this session).

Finally, I would like to state my perspective about how to relate these horse studies to human evolution. The key is “domestication.” It has been suggested that humans (and bonobos) domesticated themselves. This domestication process (or more precisely “self-domestication” process) is considered to be a key for the evolution of peaceful societies. Thus, comparisons between domesticated animals and our evolutionary closest relatives, chimpanzees and bonobos, should be insightful for understanding how societies evolve. For this purpose, our divergent research approaches are useful to investigate animals’ societies from various levels and viewpoints.

## **Mechanisms of herding to maintaining cohesiveness of harem group: different reaction of females toward the male and other females**

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In animal groups, individual interactions achieve coordinated movements to maintain cohesion. Most studies about animal movements have been conducted using GPS tracking or video tracking software. Here, we applied non-invasive approaches of drone filming and video tracking software to observe movements in the field with high temporal and spatial resolution of a socially stable group of feral horses during herding, which is male-initiated and suggested to maintain cohesiveness of the harem group. We tracked all group members and drew trajectories on this basis. When we investigated the individuals' interactions during herding, we found that there exist two different interactions (male-female and female-female) during the movements. These two kind of interactions are unique among animal groups' movements and may represent a mechanism for herding to maintain group cohesion in horses' harem group. The unique movements might be due to the long-term stable social relationships within horses' harem group, unlike many other animal groups, and the different social bonds in male-female and female-female.

## **Multi-level structure in feral horse society: Evidence from the aerial observation from drones**

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Some mammalian species of different taxonomic groups, including humans, have developed social structures with nested levels of organization. This multilevel society is one of the most complex social systems in animals, but their function and evolutionary process are still poorly understood especially for non-primate species because it requires good observation of large numbers of identified individuals. Equine groups are one of the taxa that have nested social structure, and there are some studies on several species such as plains zebras and Przewalski's horses, but not on domestic horses (*Equus caballus*). Studying the inter-group relationships of feral horses and comparing those of the other equine species may help understanding their origin and their ecological and social meanings. In this study, we aimed to reveal whether domestic horses form multilevel societies. We took aerial photos of feral horse herds in Serra D'Arga Portugal in 30 minutes interval using drones, identified all the individuals and collected their position data. In the field, we observed 21 harems, 2 bachelor groups and several solitary bachelors. Their home range were largely overlapped and the area of convex hull of these groups were significantly smaller than each home range, which suggests harems and bachelors aggregates to form a herd. Moreover, this herd had a structure that large harems were likely to be in the center, while bachelors were in the peripheral zone, and small harems were located somewhere between that. The presence of this stable spatial pattern strongly indicates the multilevel structures of feral horse society.

**Does size matter?**  
**Examining the possible mechanisms and adaptive significance of single  
and multi-male groups in Horse societies**

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Horse groups with single and multiple stallions occur simultaneously throughout the world in different feral horses' populations. There's a clear hierarchy among the stallions in multi-males' groups, where one individual is dominant over the others. The subordinate(s) helps more or less with group defense and may occasionally be able to copulate with the females. However, little is known on why such groups with more than one male exist, considering that the males naturally fight to monopolize the females. So why would a dominant stallion permit or tolerate the presence of another adult male in his group? To address this question, I observed feral horses, more specifically the Garrano horses that live in Serra d'Arga in Northern Portugal, and analyzed spatial positioning among individuals, social behavior, body size, testosterone and DNA. In this presentation I will introduce the results of these analyses and discuss about the possible mechanisms and adaptive significance of single and multi-male groups.

## Estimation of force working among individuals in feral horses

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Individuals always live with various types of forces. In animal groups, the most representative example is the attraction and repulsion rule to keep the cohesion. The rule proposes individuals adjust distance to nearest neighbors with following force working among individuals in fish schools and bird flocks. Theoretical studies have reported the effectiveness of this rule, but empirical studies are relatively few so far. Therefore, it remains unknown how much force is actually working among individuals and the effective range of both two types of forces. In the present study, we quantified both force and measured the effective range with by mathematical simulation. We made a repulsion and attraction model and compared observed data. The present study is composed from threefold results. First, horses probably have interactions until third nearest neighbors, not with all individuals. Second, the force for repulsion was estimated to be maximum around three body length, in other words, the personal space might be around three body length. Third, the force for attraction started to work around eight body length. This study suggests the first example of quantification of these types of the force in feral horses. In addition, they method will be very effective to estimate the range of personal space.

## **Investigating the causes and consequences of feral horses' disappearance and juvenile mortality in North of Portugal**

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The equine social systems are characterized by harem groups which consists of one or a few males with multiple females, and bachelor groups. Equids are unique among ungulates because of their stable bisexual groups, including their female-female bond. Garranos, a breed of ponies co-existing with wolves in the North of Portugal follows a similar pattern. Feral horses constitute about 70-80% of the wolves' diet in this area, however this population is also threatened by human activities. These activities may be interfering with the group stability and, therefore, exposing the individuals to predation and other threats. This study aims to combine a) demographic, genetic and behavioral data to examine the group size and composition effects on female social behavior, reproductive success, maternal care and foal survival b) the human interference and management politics effects on the dynamics and survival of the individuals. Data collection is still ongoing in the mountain of Serra D'Arga, Northern Portugal. However, as the behavioral data is under analysis, I present basic demographic data collected in the breeding seasons of 2016 to 2018 and introduce the methodology and preliminary results on the study of mother-foal interactions. In this population, the foal birth rate over 3 years, (2016-2018), has slightly decrease from 48% in 2016 to 32% in 2018. However, for two consecutive years (2017 and 2018) the foal mortality rate in the first six months has reached 100%. Wolf predation and human interference may be the main causes for these severe values. While this high mortality rate may compromise the future of this population, at the same time it allows us to explore and develop other research fields, such as on prey-predator interactions and thanatology.

Finally, I present the methodology that we are developing to study the interactions between horses and wolves, in collaboration with researchers from CIBIO, University of Porto.

## Free-ranging horses and Iberian wolves: ecological context and conflict management

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Despite the extensive range overlap in both horses and wolves, wolf predation on equids is uncommon and poorly studied. Horses are reported as an occasional prey for wolves worldwide, although in some regions wolf predation on equids is relevant and raises important conservation implications, either by affecting domestic free-ranging horses or endangered wild equids, such as Przewalski horses and Kulans in Central Asia. Within Europe, wolf predation on horses is reported to be most common in the northern mountains of Iberian Peninsula, where free-ranging mountain ponies belonging to autochthonous breeds (e.g. called “Garrano” in Portugal) are a main prey for Iberian wolves.

Iberian wolves feed mostly on livestock across their range, due to lack of wild prey. Among consumed domestic species, Iberian wolves seem to prey preferentially on domestic horses whenever they are available in a traditional free-ranging horse husbandry along all year, turning them more accessible for wolves than other domestic prey. Free-ranging horses represent more than 80% of the consumed biomass in some wolf packs located in northwest Portugal, with regional and seasonal variations in the consumption of adult horses and foals. Consequently, wolf predation on horses, together with other livestock species, results in economic damages to the owners, generating a strong conflict and intolerance towards wolves.

In order to reduce human-wolf conflicts, a damage compensation system is implemented in Portugal to mitigate the losses of livestock owners and reduce illegal killing of wolves. However, the compensation system is often flawed and inefficient, exacerbating the conflict between local people and wolves. Furthermore, required measures to prevent wolf attacks, such as fences or livestock guarding dogs, are non-existent or difficult to implement for a traditional free-ranging horse husbandry, resulting in a high number of compensations that are not attributed to horse owners. In absence of effective systems for damage prevention on horses, new solutions are needed to minimize horse exposure to wolf predation risk and adequately compensate owners. Yet, little information is available on horse-wolf interactions, in order to enable a more effective herd management for preventing wolf attacks.

In this context, is crucial to understand the behavioral patterns observed in horse herds, allowing more accurate predictions of which factors influence wolf predation on equids, such as herd size, number of dominant males, herd cohesion and age of the individuals. A collaborative study aiming to assess the patterns and behavioral determinants related to wolf predation on free-ranging horses, is being conducted in Serra de Argá (north-western Portugal), by taking advantage of on-going studies focused on wolf ecology, conducted by CIBIO, together with behavioral studies on horse herds recently started by Kyoto University.

## Mongolian Life with Horses

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3.9 million horses live in Mongolia, while 3.2 million people live. The forty percent of the people are nomads who move with herds in order to change the seasonal camp. Mongolian nomads use horses as vehicle and also as food. They catch one-year-old filly (female foal) for suckling to milk, and catch two-years-old colt (male foal) for castrating to ride. Through these interactions with horses they have accumulated the traditional knowledge about horses such as the scholar of ethology increase the scientific knowledge. Using many photos, I would like to introduce the annual life cycle of Mongolian nomads and also show the life cycle of horses from the viewpoint of the people's use. Recently Mongolian nomads usually use motorbike instead of horses. Therefore sometime Mongolian ethological knowledge of horses might be endangered. Before disappearing, their knowledge must be inquired scientifically.

## HORSE TRAINING

### **Towards a description of a man-animal interspecific haptic syntax: the case of man-horse (*Equus caballus*) haptic communication**

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In order to practice classical horse riding (Western horse riding conceptualized and codified as from the 15<sup>th</sup> century) the rider must use the language of hands, legs and seat. A good horse rider has mastered the action of applying pressure through touching, in other words, he has mastered tactile skills. Touch is the most valuable tool for communicating with the horse when schooling or training it, and it is the source of all natural and artificial movements. Through the most subtle movements of the hands, legs and seat, in acts of tactile communication, the horse is made to obey its rider. Mastering the individual actions of these aids is the very essence of proficiency in horse riding. This “language” of touch is very precise. It has a grammar which riding masters must acquire in the course of their long training. The different sorts of touch applied to the horse are explained when one studies all the movements from the most basic to the most elaborate.

The semiotician examines this sign language used to communicate with horses in order to identify its fundamental syntactical structure through which meaning can be produced. We shall start by describing the logic of the rider’s language of aids, in the tradition of the riding master François Baucher. We shall then identify the nature of the syntactical structure operating in the inter-specific tactile, or haptic, communication between horse and rider. Lastly, we shall discuss the possibility of an implicit archaic syntax which can explain at a more general level the mechanisms of man-animal communication, from a zoo semiotic perspective.

## How Horses See the World: Five Years of Endeavor of Horse Cognition Project

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We have been studying how evolutionarily adapted environments affected the mind of various kinds of mammals including humans. Our mind, as well as the other species' minds, is the result of the mixture of phylogenetical constraints and adapted environments. Thus, we share the similarities and differences with other species from the different origins. Among various species of mammals, horses are one of the most interesting species to be studied in the field of comparative cognitive science. In comparison with chimpanzees, for example, they have adapted to the open land like humans, but each of them adapted to those environments in different ways. How these similarities and differences shaped our and their minds? Furthermore, horses are not “wild”; they have been selected by humans for the purpose of our own.

Based on the methodology developed through the comparative cognitive science of chimpanzees, we introduced the touch screen to the horse for the visual-cognitive studies. It enabled us to avoid the fallacy called “Clever Hans Effect” and to compare directly with primates. Three ponies, Ponyo, Nemo, and Thomas, successfully participated in this project and showed us the fragments of what and how they see their visual world. Starting from the simple size discrimination, we successively tested their ability of discriminating and categorizing the simple geometric forms, relative numerosity judgments, and perceptual concept formation of the “horse”.

In this talk, we briefly summarize the five years of endeavor of our horse cognition project.

## **Preliminary assessment of new machine learning model for extracting and analyzing horse vocalization**

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For a better understanding of animal behavior or society, various studies on animal vocalization have been conducted. In this sort of study area, researchers sometimes encounter with nonlinear dependencies and unclear interactions coming from large data set, and thus they may fail to conform to the classical statistical methods which results in limiting the analytical power on those data. Recently, by using machine learning (ML) for acoustic studies, the expected following features have been emerging: 1) automatic extracting of certain vocalizations from large data set on acoustic recordings, 2) extracting unknown acoustic features from those data sets. In this preliminary research, we aimed to extract three types of vocalizations (whinny, nicker, blow) of horses (*Equus caballus*) by using the new ML model and to test its accuracy. We recorded horses' vocalizations in four contexts/situations: 1) separation from a familiar individual(s), 2) demanding food to human, 3) aggression to another individual, 4) free ranging. We compared the number of vocalizations extracted by the ML model and that counted manually by the authors from the same data set. In this presentation, we will show the result of the evaluation of the accuracy of the ML performance. By using this ML, we will investigate the possible context-specific features of horse vocalizations.

## Molecular markers for domestication history of the horse

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Horses have shared a long history with humans as the domestic animal. Horses sometimes supplied meat, but the main purpose of their use was for working. Horse's excellent physical ability contributed greatly in the way of transportation and agriculture, and sometimes in the scene of war. Unlike domestic animals that were mainly kept for meat such as cattle and pigs, horses worked together with humans in various situations. Since horses live in a group, the life with humans may have been an extension of their activities in the group. The personality of horses might have been an important target of selection in the process of domestication of horses as well as dogs. On the other hand, dogs are carnivorous and horses are herbivorous animals, therefore their behavior patterns inherited from their ancestors and their group structures are different each other. Currently, there are few opportunities for dogs to work together in a group. However some horse populations were rewilded and individual relationships within conspecifics can be observed. These differences between horses and dogs might have affected the relationship between horses and humans or between horses.

It is difficult to objectively describe animal minds. The comparison between species is more difficult due to various factors. Therefore, we are studying to describe the animal mind with molecular markers related to personality, that is, individual differences of genes. We analyzed genes related to neural transmission and hormonal transmission, which constitute the background of personality, in various animal species including dogs, horses and ungulates such as camels and zebras. In this presentation, we introduce the attempt to approach the equine mind through analysis of candidate gene polymorphism and its relation with personality traits. Also, due to next generation sequencing technology in recent years, enhancement of genome information for ancient DNA is remarkable. We would like to introduce genome studies uncovering the history of domestication of horses.

## **“Field Museum” project in Amazon**

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Biodiversity of Amazon is threatened by increasing human activities in this region, especially in the area around Manaus, the largest city in Amazon, with rapidly increasing population over 2 million. To solve the biodiversity crisis and degradation of tropical ecosystems in this region, we started a 5 years project entitled “Biodiversity conservation in Amazon based on a new concept of “Field Museum” (JST/JICA SATREPS project) in collaboration with National Institute for Amazonian Research (INPA) in 2014. This project aims to develop a “Field Museum” in Amazon, in addition to promote conservation studies for various wildlife, such as Amazon manatee, Amazon river dolphins, monkeys, sloths, etc. For conservation of large animals, especially for their relocation programs, we need facilities for captive and semi-captive animals in addition to the long-term researches in their natural habitats. These facilities and nature reserves necessary for large animal conservation can be used for the studies, conservation and education of other various organisms, too. Field Museum will be a network of nature reserves and observation facilities in natural habitats of wildlife, where we can observe various organisms in captive, semi-captive and wild condition as well as research and conservation activities. It can contribute not only to the study, conservation and environmental education of various organisms, but also to the local community through civil ecotourism and as a center for conservation of local ecosystems. We developed the following facilities in and around Manaus for the field museum in Amazon named as “Museo na Floresta” (Museum in the forest): Cuieiras field station in a INPA forest reserve that can accommodate 60 people for research and ecotourism, a 40 m tower for observation of forest canopy, renovated exhibition of “Science House” in “Science wood”, an isolated forest in Manaus used for environmental education by INPA, and captive and semi-captive facilities for rescued Amazon manatees. In this project, we also conducted a relocation program of Amazon manatees using these newly developed facilities. Before our project, more than 60 rescued manatees were kept in very old tanks without water-recycling system and all trials of relocation were failed because released manatees could not eat wild plants. So, we renovated the manatee tanks and took “soft releasing method” in which the animals were released after training in semi-captive environments (an artificial lake for fish cultivation beside the Amazon river) to eat wild plants. Behavior of the released manatees were monitored by radio tracking and bio-logging technic for more than 6 months. We released 19 manatees in total during last 3 years. Results of the monitoring showed that they well adapted to the wild condition. Especially, one of the released manatee accidentally recaptured about 1 year after releasing increased its body size, clearly indicating that it well adapted to the wild environment. Every time when we released the manatees in the nature reserve of Purus river, we also conducted environmental education events for the local people, especially for the children of the local communities, many of them have a history of manatee hunting. We will continue Japan-Brazil collaboration to promote the study, conservation and education for sustainable development using the field museum in Amazon after this project.

## Characteristics of Tropical Forests in South America -Special Mentions on Seed-dispersal by Animals-

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The tropical forest in South America is one of three main-blocks (South America, Southeast Asia, Africa) and three sub-blocks (Madagascar, New Guinea, India-Sri Lanka) of tropical forests in the World. The major biological differences between these six regions result largely from the interactions among: phylogeny, plate tectonics, past climate and sea-levels, present environment, and past and present human activities (Corlett and Primack 2011). These differences make the six different tropical forests almost independent “experimental fields of evolution”. Tropical forests in South America contain largest area of rainforest today, and accommodate most diverse flora and fauna for vascular plants, birds, butterflies and many other groups.

Especially, forests in Amazon Basin characterizes themselves as an extreme environment of black-water flooded forests (Igapo), where are seasonally inundated with fresh-water. The water-level differs more than 10 m between the highest and the lowest ones. These great change of water-level makes these forests quite unique ones “interface of freshwater and forests”, and has developed the special modes of seed dispersal in angiosperm as ichthyochory (seed dispersal by fish). More than 275 frugivorous fish species belonging to the mainly Neotropical Characiformes (pacus, piranhas), Siluriformes (catfishes) and other groups were reported (Horn *et al.* 2011). Among ichthyochory, the extensive mobility of large-bodied species such as *Colossoma* translates into extremely long distant seed dispersal, which rivals seed dispersal by Asian elephants and African hornbills (Anderson *et al.* 2011). Anderson *et al.* (2011) estimated the modeled mean dispersal distance of 337-552 m with the maximum of 5495 m by *Colossoma*.

Of course, other groups of frugivorous animals including birds and primates play important roles in seed dispersal in South America. We have studies seed dispersal distance of woolly monkeys (*Lagothrix lagotricha*) and red howlers (*Alouatta seniculus*), and Salvin's curassow (*Mitu salvini*) in Colombia by “isolated-bout methods” (Yumoto *et al.* 1999, Yumoto 1999), and estimated the retention times and seed dispersal distances. As the results, the estimated retention times via fecal dropping of woolly monkeys varied from 2 h to 14.5 h, according to the plant species, and the estimated dispersal distances from 126 m to 760 m. In cases of howlers, retention times were much longer than woolly monkeys (19.1 h - 21.3 h), but the dispersal distances were even less (189 - 444 m), owing to the smaller home range. As for Salvin's curassow, the mean and maximum retention times for *Ficus sphenophylla* via fecal dropping were 3 h 15 min ( $\pm 37$  min) and 7 h 08 min. and the mean and maximum dispersal distances were 329 m ( $\pm 46$  m) and 451 m. Interestingly, the retention times for *Streptogyna americana* which has adhesive burrs showed more skewed distribution: estimated the mean and maximum values were 1 h 55 min ( $\pm 1$  h 56 min) and 9 h 11 min. But the mean and maximum dispersal distances were even shorter as 128 m ( $\pm 68$  m) and 280 m.

## **Animal research of SATREPS 'Museu na Floresta' in Cuieiras Biological Reserve, INPA, Brazil**

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The project 'Biodiversity conservation in Amazon based on a new concept of "Field Museum" (nicknamed in Portuguese: Museu na Floresta)', in Science and Technology Research Partnership for Sustainable Development (SATREPS), Japanese international research cooperation program, has been carried out in Amazon through the cooperation between Instituto Nacional de Pesquisas da Amazônia (INPA) and Kyoto University. In this multi-research area project, a new research/environmental education base was opened in the Cuieiras Biological Reserve of INPA. There are several types of vegetation and the transition areas in the reserve around the base, such as igapo (flooded forest) along Cuieiras river, terra firme (non-flooded forest), campinarana (white sand vegetation), associated with diverse animal communities. Still many aspects of their ecology and diversity pattern are unknown, but now we have many future potentials for research in this area by construction and renovation of facilities and their network, also for the future researchers. The forest research team of our project have started animal research using camera-traps. We are obtaining the first data on terrestrial mammals/birds and partially arboreal mammals in the igapo forest and the terra firme forest in this area, with cooperation of peoples from the local community along the lower Cuieiras river. We will compare abundance and composition of animals between forest types.

## Monitoring the activity and thermoregulation of wild three-toed sloths by using heart-rate, temperature, and GPS loggers

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Recent developments of animal-borne data loggers enable us to monitor the activities of wild animals in their natural habitat. In the present study, we attached a heart-rate, temperature, and GPS loggers on wild three-toed sloths, *Bradypus tridactylus*, to reveal the energy-saving life of this highly sedentary species living in the Amazon rainforest.

Three-toed sloths are characterized by their slow-moving behaviour and strict folivorous diet. Herbivorous mammals tend to have large digestive organs which make the animal bigger; however, their arboreal lifestyle makes it difficult to have large body size. Supposedly their calorie intake is very low due to the low available caloric density of leaves and slow digestive process relating bacterial breakdown of structural carbohydrates and detoxification of secondary compounds contained in leaves. They would need high body temperature to assist bacterial breakdown; however, thermogenesis is energy-consuming. Then, we can predict that this species strikes a balance between limited energy consumption and high body temperature.

Our result showed that the heart-rate of sloths was much lower than that of typical endotherms; the average heart-rate was 36.7% (range 28.1–44.5%) of the expected value calculated from their weight. Their body surface temperature changed with ambient temperature, suggesting that they lack a homeothermic nature and consume little energy for thermoregulation. Indeed, the relationship between heart-rate and ambient temperature was similar to that of endotherms; heart-rate was slightly increased with ambient temperature. However, their body surface temperature tended to be much higher than ambient temperature when ambient temperature was low, but lower than ambient temperature when the ambient temperature exceeded 36°C, as if they tried to keep their body surface temperature between 25–35°C. They may have increased body temperature by heliothermic way, and the efficient insulation and/or fermentation heat as a by-product of digestive process may contribute to retain the body temperature.

The data from GPS loggers corroborated their sedentary nature: the average home range size was  $2.71 \pm 0.26$  ha (range 1.77–4.36 ha) during 93-day observation period. Contrary to the general prediction that larger individuals require larger home ranges, there was a negative relationship between body weight and home range size in our study. This counterintuitive result may be caused by disparities in the food-exploring abilities among individuals; smaller and presumably younger and less experienced individuals may need a longer time and larger area to explore for food. Experiences may be necessary to achieve their lazy life.

## **Comparative Perspectives on Behavior Patterns and Plasticity: What the Northern Muriqui can Teach us About Apes and Other Primates**

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The northern muriqui (*Brachyteles hypoxanthus*) is the largest New World monkey and one of the most critically endangered primates in the world. Unlike its closest relatives, the woolly monkey (*Lagothrix* spp.) and spider monkey (*Ateles* spp.), the muriqui is endemic to the Atlantic Forest of southeastern Brazil. Yet, despite its phylogenetic and geographic distance, many features of muriqui behavioral ecology are more similar to those of African apes than they are to other monkeys. From their relaxed promiscuity to their female-biased dispersal and slow life histories, which permit mothers to play life-long roles in their sons' and grandsons' lives, northern muriquis provide comparative insights into shared behavior patterns more commonly associated with apes. Long-term data spanning nearly 36 years from the Muriqui Project of Caratinga also illustrate a high capacity for behavioral and ecological flexibility in response to demographic change. Examples of muriqui responses to rapidly changing local conditions have implications for understanding the adaptive potential of apes and other endangered and critically endangered primates.

## **Invitation to the 14<sup>th</sup> International Conference on Environmental Enrichment**

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The 14<sup>th</sup> International Conference on Environmental Enrichment (ICEE KYOTO 2019) will be held between 22<sup>nd</sup> and 26<sup>th</sup> June. The leading graduate program in primatology and wildlife science of Kyoto University is one of the main hosts of this conference. This is the first international conference on environmental enrichment held in Japan. The theme of the conference is “Learning from the wild: animal welfare, conservation and education in harmony”. As any activity to improve animal welfare should be based on the fundamental understanding of animals living in the original habitat, we hope that we could integrate the perspectives of people working with wild animals and for improving animal welfare in captive settings in this conference. Through various scientific and social events, we also expect active discussion over animal welfare among participants coming from various cultural background. In this presentation, I would like to talk the tentative plan of the ICEE KYOTO 2019 and also briefly introduce history of environmental enrichment and its conference.

## A cross-modal preferential looking experiment in chimpanzees

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Chimpanzees (*Pan troglodytes*) are known to use a variety of vocalizations to communicate with each other. Signalers adjust their vocalizations flexibly depending on contexts, such as audience composition and knowledge status, and receivers change their behaviors and physiological states accordingly to the “meaning” of the signal. For example, chimpanzees emit a food call to signal the presence of food resources depending on the audience compositions. Also, chimpanzees emit an alarm call to signal the presence of a potential threat (e.g. snakes) depending on the knowledge status of audiences, and the audiences change their behaviors and physiological states appropriately to prepare for the specified threat. Such interactions between signalers and receivers suggest that their vocalization has a “referent” or a specific object to be attended. However, to support this idea, it is crucial to test whether chimpanzee audiences have mental images when hearing corresponding vocalizations. This study thus used a cross-modal preferential looking paradigm: specifically, we presented to chimpanzees both images of a snake and a food while playing either of an alarm call or a food call. If they have a mental image for each vocalization, they would selectively look at the image of a snake or a food when hearing the playback of an alarm call or a food call, respectively. Overall effect was not statistically significant, although we may have observed such a pattern, particularly in the last phase of stimulus presentation. Possible methodological concerns are also discussed in this presentation (e.g. sample sizes, duration of auditory and visual stimulus).

## **Cross-species FACS review and a new muscle-based coding system to measure Japanese macaques and Common marmosets facial movements**

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Facial expressions are complex and subtle signals, central for communication and emotion production and perception in social mammals. Traditionally, facial expressions have been classified as a whole (e.g. happy, bared-teeth display), which makes cross-species comparisons incomplete, missing small but relevant differences in displays. Furthermore, they can be difficult to study due to the automatic holistic processing of faces in the brain, i.e., our brains easily categorize emotion, but do not perceive individual movements. This is also problematic as the same morphological facial configuration (e.g. lip corners pulled backwards exposing the teeth) can convey widely different information depending on the species (e.g. humans: greeting/happiness; chimps: fear/submission). Hence, FACS (Facial Action Coding System) takes a different approach in order to avoid *a priori* mistakenly assumptions of meaning or contextual information, by objectively measuring movement derived from underlying facial muscles, coded in independent movements or Action Units. The well-known human FACS has been used as a gold standard for human facial expressions, and has been adapted for a variety of species through the use of muscular homologies, allowing for cross-species systematic comparisons of facial expressions. Here we review the ChimpFACS, MaqFACS, (Rhesus and Barbary macaques), OrangFACS and EquiFACS, and their application to the investigation into individuals' cognition (e.g. intentionality of play faces during orangutan play, how chimpanzees classify their own facial expressions). We then introduce the latest FACS adaptations underway for Japanese macaques and Common marmosets, which will shed new light into communicative and cognitive aspects in these species from a comparative and evolutionary perspective.

## Visual discrimination of threatening faces in chimpanzees

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For primates, the ability to recognise and discriminate conspecific facial expressions is essential for survival. This study investigated the ability of chimpanzees to discriminate three categories of unfamiliar conspecific facial expressions: neutral, bared teeth and scream (both threatening expressions). Five adult female chimpanzees participated in a touchscreen two-choice matching-to-sample task. We predicted higher accuracy for discriminating between neutral and threatening expressions (perceptually different) than between bared teeth and scream expressions (perceptually more similar). Overall, discrimination accuracy was significantly above chance for all categories of facial expression, although accuracy was significantly higher for discriminating between neutral vs. bared teeth or scream expressions, than between bared teeth vs. scream expressions. Interestingly, for bared teeth-neutral and scream-neutral pairs, accuracy was significantly higher when the sample images were threatening expressions than neutral expressions. However, for bared teeth-scream pairs, no difference in accuracy was found when the sample images were either bared teeth or scream expressions. Consistent with previous research in chimpanzees, our results suggest that bared teeth and scream expressions are perceived as perceptually more similar to each other than to neutral faces, and that threatening expressions may capture attention to a greater extent than neutral expressions.

## **Emotional conflict monitoring and adaptation: An ERP study based on the face-word stroop task**

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In previous literature it has been established that the previous trial congruency influences the current trial processing. It also has been found that the relevant and irrelevant positive and negative valence influence the trial congruency sequence effect. Researchers have compared the effect of different positive (happy) and negative (fear) valence on conflict monitoring task using face word stroop. Happy and sad emotion has not been compared which in this research has been compared using face word stroop and effect of previous trial congruency on current trial also seen. Moreover, current study explores the ERP correlates of conflict adaptation (N2), which supposed to be reduced after high conflicting trial preceded by another high conflict trial. Overall ERP result show's larger N2 mean amplitude for negative valence (sad) processing than positive, this indicates that the negative valence processing influenced more by relevant and irrelevant emotional content than positive valence processing. Smaller N2 amplitude has been found for incongruent trials preceded by incongruent trials (iI), similar for congruent trial also (cC), showing conflict adaptation effect, but such effect does not found for positive emotion though this effect was there for low conflict trials (cC).

**Key words:** Conflict monitoring, conflict adaptation, N200, Face Word Stroop.

## **A longitudinal investigation into captive chimpanzee sleeping behavior**

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Primates, like many other animals, spend around half of their lifetime sleeping, yet this behavior is almost completely unstudied compared to those which occur during the daytime. In natural habitats it might be difficult or impossible to directly observe nocturnal activities, but in captivity, where we are able to closely monitor both day and night activity, the opportunity exists to record, study and thus better understand individual and/or group sleeping behavior and patterns. Human sleep patterns have been shown to change with increasing age, with sleep quality diminishing, and whether this also occurs in our close primate relatives is unknown. Morimura et al. (2012) published one of the only two existing studies describing captive chimpanzee sleep patterns non-invasively, utilizing video recorded from around 11 years ago at Kumamoto Sanctuary. I plan to replicate this study, which requires collecting night recordings of some of the same individuals to investigate whether or not their sleep patterns change with age. At the PWS spring symposium I will present my progress with this project so far.

## **The Prevalence of *Cryptosporidium* spp. and *Giardia* spp. infection in Long-tailed macaques (*Macaca fascicularis*) and proboscis monkeys (*Nasalis larvatus*) in the Lower Kinabatangan floodplain**

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Ecologically, infectious diseases arise as an outcome of host-parasite relationships. As human populations grow, the inevitable landscape changes have resulted in an increase of disease outbreaks and emergence events, and have modified the transmission dynamics of parasites in general. Nonhuman primates around the world are exposed to various agents of infectious diseases that can threaten their survival, especially those that are endangered due to habitat disturbance or hunting. Globally, both metazoan and protozoan parasites have been recognized as important contributors to disease burdens, but protozoan parasites such as *Cryptosporidium* spp. and *Giardia* spp. may be of particular concern for wild primates in human-wildlife interface areas. Both are known pathogens of primates and are potential zoonoses moving between human and nonhuman primate populations. The present study aimed to screen for the presence and prevalence of these parasite genera in long-tailed macaques (*Macaca fascicularis*) and proboscis monkeys (*Nasalis larvatus*) inhabiting the Lower Kinabatangan Floodplain in Sabah, Malaysian Borneo. We noninvasively collected a total of 126 fecal samples from the banks of the river below sleeping trees, and used rapid immunoassay test kits (CoproStrip®, Savyon Diagnostics) to screen for infection. Preliminary analyses suggest that 16.13% of long-tailed macaques and 78.13% of proboscis monkeys inhabiting the region are infected with *Cryptosporidium* spp., while the prevalence of *Giardia* spp. was 24.20% and 7.81% for these primates, respectively. While we do not yet know whether these parasites cause disease in the region, or whether they might be shared with the local human population where ranges overlap, our results warrant further such investigation and provide a baseline data set to build on.

**Keywords:** Primates, Anthropogenic, Infectious Diseases, Protozoan Parasites, Gastrointestinal parasites

## **Comparison of internal organ weight among generations in captive Japanese Yaku macaques, *Macaca fuscata yakui***

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Captive condition in zoo is different from wild environment in various aspects such as climate, food, activity, and population density. This unique condition makes various differences in captive individuals compared with wild individuals. Japan Monkey Centre (JMC) has kept one group of Japanese Yaku macaques (*Macaca fuscata yakui*) since 1957. Throughout 60 years of history, zoo staffs recorded information about more than 850 individuals, with maternal lineage. JMC also stores many dissection records and skeletal specimens of dead individuals. Thus, Japanese Yaku macaques of JMC is important resource to investigate morphological change under captive condition. In this study, I focused on weight of six internal organs; spleen, pancreas, liver, kidney, heart, and brain. I picked out each measurement data from dissection record of 82 adult individuals. I compared these data among the generations based on maternal lineage. As a result, male organs showed weak tendency of which second generation is larger than other generations. In female, this tendency was not observed. Similar trends observed in multiple organs suggested that total body size of males was changed. Improved nutrient condition and higher population density are possible factors of observed body size change.

## **Salivary alpha-amylase enzyme is a biomarker of acute stress in Japanese macaques (*Macaca fuscata*)**

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Salivary alpha-amylase (sAA) enzyme functions as a digestive enzyme in many species which consume starch in their diet. However, over the last several decades human studies have revealed sAA enzyme activity levels are positively correlated with the release of the *fight-or-flight* stress hormone norepinephrine, allowing sAA to act as a biomarker for sympathetic nervous system (SNS) activity. The SNS is a separate but parallel stress response system to the hypothalamic-pituitary-adrenal (HPA) axis. Recent non-human primate studies have begun including sAA as a physiological stress marker in rhesus macaques, chimpanzees, bonobos, and gorillas. However, to date, there are no published reports investigating the time course of sAA from a stressful event to return to baseline levels in non-human primates. Furthermore, no validation of sAA as a stress biomarker has been reported for Japanese macaques. Validation of sAA enzyme as an acute stress biomarker in *M. fuscata* could provide a useful tool for stress-related research questions as well as practical uses in animal welfare. This study had two primary aims: [1] develop a systematic method for non-invasive saliva collection and [2] investigate sAA as a biomarker of acute stress in *M. fuscata* in order to better understand its acute stress-related characteristics. We developed a non-invasive method for cooperative saliva collection using positive reinforcement training (PRT) and tracked individual progress over 595 trials in 10 individually housed Japanese macaques. Then, we confirmed that *M. fuscata* possess sAA enzyme via kinetic reaction assay. Finally, we performed 22 acute stress tests to verify when sAA activity returns to baseline after an acute stressor. Our report reveals for the first time the temporal dynamics of sAA when applying acute stress to a non-human primate.

## Understanding disease transmission potential between wild ungulates and domestic livestock in the Indian Trans-Himalayan region:

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Transmission of disease and parasites between sympatric species of the wild and domestic is a phenomenon of global concern is a significant threat to conservation efforts as it impacts viable wild populations. At the same time, this threat is of concern to livestock-owning communities as diseases decrease livestock production. This is the first study which attempts to assess this threat in the trans-Himalayan system. The Himalayan blue sheep, a wild ungulate of the high-altitude Himalayas, is a key prey species of the globally endangered Snow leopard. The Himalayan blue sheep have to inevitably share their grazing pastures with the domestic livestock. The sharing of pastures enables a platform for transmission of gastro-intestinal nematodes (GINs) between the blue sheep and livestock. Additionally, this study also looked at socio-ecological factors that drive the livestock health management system of the study region, which consequently has an effect on the prevalence of diseases in livestock, and its potential subsequent transmission to the blue sheep. For an effective disease control or management, knowledge of the dynamics of the infection pressure of parasites is important. This study also makes use of the GLOWORM-FL model to simulate variations in the infection pressure in the study region.

To examine the parasite burden, livestock pellet samples were collected from 60.7% of all livestock-owning households from six villages, while blue sheep pellet samples were collected from four pastures. Faecal egg count (FEC) was done for the pellet samples using the mini-FLOTAC technique to estimate the diversity and abundance of the parasitic gastro-intestinal nematodes (GINs). IN order to understand the livestock health management practices, semi-structured interviews were taken from 50.3% of households in all six villages, and officials from the animal husbandry department. The GLOWORM-FL incorporates the life-history patterns of a parasite species to simulate the parasite's behaviour in response to the local temperature and precipitation conditions in order to predict the variation in infection pressure across seasons.

The FEC revealed the presence of GINs from eight taxa out of which five are shared by blue sheep and livestock, indicating a significant potential risk for spill-over from livestock to blue sheep and vice-versa (spill-back). About 79.3% of the respondents had virtually no knowledge of existence of endo-parasites in their livestock, which reflects poorly on the efficacy of the livestock health management system. T-test comparing the parasitic burden between livestock and blue sheep indicated that there is a significant difference (p-value<0.05), with the average parasite burden in livestock (FEC=1628.38 EPG) being much higher than that in blue sheep (FEC=70.76 EPG). The GLOWORM-FL model used for Strongyle nematodes gives indication of the periods of time when the infection pressure would be the highest or lowest, thus, acting as a potential tool to develop appropriate conservation and management strategies. Efficient treatment with anthelmintic drugs will control the parasite burden in livestock, which can subsequently delimit the risk of transmission to blue sheep, thereby guarding the population of this important prey species against future disease outbreaks.

## **Analysis of arginine-vasopressin receptor gene (*AVPR1A*) in Hokkaido horses**

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Arginine vasopressin (AVP) is a neuropeptide that affects some social behaviors in mammals. Previous studies reported that polymorphisms in the number of repeated sequences in the arginine vasopressin receptor 1A gene (*AVPR1A*) affected social behaviors in humans and rodents. In this study, we explored polymorphisms in *AVPR1A* in horses. We focused on one of the native Japanese horse breeds, Hokkaido horses. The sequences of 5', intron, and 3' regions of 48 Hokkaido horses were determined. We found a polymorphism in the intron region. This polymorphism consisted of repeats of (GT)<sub>9</sub>(GA)<sub>10</sub> sequence and 5 alleles (309, 313, 315, 317, and 323) were found. We compared the allele frequency with other breeds (Taishu, Criollo, and Thoroughbred). In Hokkaido horses, the 323 allele was the most major, however this allele was not found in Criollo and Thoroughbred horses. This result suggests that the allele frequency is different between horse breeds. In future, elucidating the association between the polymorphism and behavior, especially social behavior or reproductive behavior is needed.

## Dietary adaptation of leopards in Mahale, Tanzania.

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The leopard (*Panthera pardus*) has the widest distribution among wild felids (Hunter, Henschel, & Ray, 2013). In general, leopards prefer prey weight ranges between 10–40kg ungulates, with a preferred mean prey weight of 23 kg (Hayward et al., 2006). Some studies in rainforests suggest that leopards may hunt arboreal primates when they descend on the ground or get carrion (Hart et al., 1996; Zuberbühler & Jenny, 2002). On the other hand, McLester et al., (2018) reported an observation of leopard hunting on an arboreal primate 4m above ground in the trees. Leopard predation pressure on primates may be significant in open habitats than in tropical forests, because broken canopy and low tree height may disturb arboreal primates escape successfully. However, there is no study of diet of leopards which is conducted in open habitat with arboreal primates. Therefore, further study is needed to reveal their predation pressure on arboreal primates in open-habitats.

This study was conducted in Kasoje area, Mahale Mountains National Park, Tanzania. The density of middle-sized ungulates weighing 10–40kg is scarce (Uehara & Ihobe, 1998). On the other hand, arboreal primates weighing less than 10kg inhabit in high density. The vegetation of Mahale is transitional between savanna and tropical forest; broken canopy and low tree height compared to rainforests.

I collected 256 leopard scats along trails from 2014 to 2017, and extracted bones and hairs were then identified macroscopically and microscopically. The analysis revealed that blue duiker (*Philantomba monticola*) were the most dominant prey species, followed by red colobus (*Procolobus rufomitratus*). Primates were most dominant for the Order level, which occupied 53.2% of relative biomass consumed.

Density of arboreal primates in Mahale is higher than in tropical forests, but the relative biomass consumed of arboreal primates in Mahale was higher than in tropical forests. The broken canopy and low tree height may help leopards to hunt arboreal primates easily.

## **Insights on low-frequency (rumbles) vocalizations in free-ranging Asian elephants**

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Several mammalian species use acoustic signals to communicate with conspecifics for various ecological contexts such as mating, aggression, alarm, territory, etc. These signals can be both short and long distances depending on traits of the species, habitat and their social structure. For instance, elephants have a unique ability to communicate both over short and long distances by using low-frequency (rumbles) vocalizations. Studies of African elephants have reported that these vocalizations can reach as far as 1.5 km carrying information on their reproductive status, for contacting separated individuals, to establish hierarchy and to avoiding competitions. However, use and function of rumbles in free-ranging Asian elephants is virtually unknown. In this study, we make an attempt to understand how Asian elephants use rumbles to communicate with conspecifics, by following them on foot in forests of Southern India. Unlike African elephants, Asian elephants live in a smaller group, in a fission-fusion type of society, and do not seem to show hierarchical social structures. We found that Asian elephants use rumbles in various contexts, but predominantly as contact calls. The mean fundamental frequency of rumbles produced during social interactions is generally around 25Hz, suggesting that elephants can adjust the frequencies of the call depending on the inter-individual distance. Rumbles were also used as ‘alarm’ calls when disturbed along with other high-frequency call-types and showed clear frequency modulations when compared with rumbles during social interactions. Adult females seem to use rumbles often when compared with young ones. These insights indicate that Asian elephants use rumbles as one of the primary call-types to communicate with their conspecifics. However, further studies are required to understand how Asian elephants use rumbles as long-distance communication calls with respect to their habitats.

## **The diet and distribution of the elephants in the Kibale National Park, Republic of Uganda**

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In Kibale National Park (KNP), Uganda, Africa, the density of elephants has increased more than 300% from 2001 to 2003 due to the migration of elephants from the Democratic Republic of Congo (DRC) into Uganda. This increase in elephant population density in KNP has led a rise in human-elephants conflicts within the region. This migration has resulted in recent genetic analyses that document the hybridization between savanna elephant (*Loxodonta Africana*) and forest elephant (*L. cyclotis*) in this area. Despite recent interest in the elephants of KNP, little is known about elephant ranging patterns and behavior. A better understanding of elephant behavior is needed to more effectively deal with human-elephant conflicts, as well as promote the elephant conservation.

This study focuses on quantifying elephant habitat preference in KNP. I conducted line transect censuses in a variety of vegetation types during both the dry and wet seasons of 2017-18. Distance sampling of dung counts was performed along transects. Survey were also conducted along the border of the KNP to assess patterns in elephant occurrence relative to villages and vegetation types.

Totally 1034 dungs were detected during the study period. Results show that the frequency of habitat use was significantly higher in secondary forests and grasslands than in undisturbed forests. The number of elephant occurrences near the KNP border were higher in dry season than in rainy season, and they often occurred along the edges of secondary forest.

These results suggest that secondary forests and grasslands are important habitat for elephant in KNP, and the villages near these habitats are at high risk of crop-raiding by elephants especially in the dry season. This research contributes important information that can be used to predict elephant behavior and inform management practices aimed at preventing damage to agriculture and community livelihoods in villages surrounding KNP.

## **Diet of forest elephants by fecal analysis at Moukalaba, Gabon : Does body size matter?**

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Elephants are polygamic herbivores and they have large sexual dimorphism. In such herbivores, it has been proposed that they have intraspecific variations in feeding patterns according to body size. However, in case of elephants, few studies have focused on dietary changes in relation to differences in body size with growth. Compared to savanna elephants, less has been known about food choices of the forest elephant (*Loxodonta cyclotis*). Thus, the objective of this study is to clarify their diet by fecal analysis and to see if there are any dietary differences according to dung size (a possible proxy for body size). I conducted field work in and around Moukalaba-Doudou National Park, Gabon, from September 2018 to February 2019. Fifty-eight fresh intact piles of forest elephant feces from September to November were already analyzed. I measured diameters of several boluses from each fecal pile on site and one bolus was brought back to the research station to analyze feeding contents. After washing and drying, food remains in feces were divided into six categories: dicotyledonous leaves; wooden materials; fruits; monocotyledonous leaves (without Marantaceae) including fine fibers; Marantaceous leaves; and piths. Twenty-three fruit species were identified. The proportions of dicotyledonous leaves and wooden materials had positive correlations with dung diameter, and the proportion of monocotyledonous leaves had negative correlation. These results suggest that small young individuals have the tendency to eat monocotyledonous leaves more frequently than large aged individuals in Moukalaba. This inference is made because there were more monocotyledonous shoots in savanna than in forest during this period and such shoots may be easier for younger elephants to digest.

## **Whistle characteristic of wild Indo-Pacific Bottlenose dolphins (*Tursiops aduncus*) in Jeju Island, Republic of Korea**

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Dolphin vocalization mediates complex social behavior and navigation while obtaining information on the environment. Indo-Pacific bottlenose dolphins, *Tursiops aduncus*, produce numerous type of acoustic emission including clicks, pulsed signals, and tonal calls. Tonal calls are the diverse repertoire of whistles and signature whistles for communication which exhibits a variation between geographically separated populations of *T. aduncus*. Therefore, the baseline study of whistle characteristic is a necessity when investigating a novel population. A relatively unknown and unhabituated population of *T. aduncus* is found in the largest island of the Korean peninsula, Jeju Island. This population utilizes inshore habitat around the island and exhibit geographic isolation. The whistle characteristic, including whistle class, number of contour inflections, and number of harmonics, beginning frequency, end frequency, maximum frequency, minimum frequency, and duration were measured as the first step to understand the vocalization of Jeju Island dolphin population. For the first time, a description of undisturbed whistles of Jeju dolphin population is made. Using this baseline data, fine-scale investigation of vocalization and behavior will be conducted in the future. Furthermore, the effect of a suddenly increased inshore anthropogenic activities on the vocalization and behavior of Jeju dolphin population will be monitored as part of the long-term conservation plan.

## How bottlenose dolphins used human competitor cues?

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Some animals including chimpanzees have abilities of joint attention or using pointing cue. In addition, chimpanzees may use reaching cues more skillful in a competitive context than in a cooperative one. Bottlenose dolphins (*Tursiops truncatus*) may use the pointing cue or face direction of the trainer. In contrast, the other studies suggest that dolphins pay attention to the trainers' gestural sign rather than their head direction. However, the effect of social context did not well understand. We investigated what kind of human's attention was recognized by bottlenose dolphins. Participates were one adult male, Luster, and one adult female, Tenten, in Kagoshima City Aquarium. Two basketballs were placed on the poolside Dolphins dropped down the ball on the water surface and gave it the trainer by the gestural sign of the trainer. However, one of the two balls was hindered by the experimenter to drop it. The experimenter gave six types of cues to aim the ball. The first condition was single condition that one experimenter stood behind one ball and reached her hand for it. The second was two-person condition that one experimenter stood behind one ball and reached her hand for it, but the other experimenter stood behind the ball with her back to it (she did not impede the dolphin). Thirdly, in the face condition, one experimenter stood between the balls and set her face toward either ball. The fourth condition was back that one experimenter stood behind either ball with her back to the ball (i.e., the dolphin was not impeded by the experimenter). The fifth condition was motion 1 that the experimenter stood between the balls and try to reach one ball to exaggerate motion. The last condition was motion 2 that the experimenter stood between the ball and reached the ball to the slight motion. One session consisted of 10 trials. Dolphins were tested for 10 sessions for each condition. Luster used single, motion 1 and motion 2 cues above chance level for first 5 sessions. In addition, the success rate of single, back, motion 1 and motion 2 cues was higher than two persons and face conditions. Tenten used single, two persons, motion 1 and motion2 cues above chance level for first 5 sessions. The success rate of single, back and motion 2 was higher than two persons, face and motion 1. In back condition, both individuals choose the ball that the experimenter did not stand behind more frequently. Success rate of first 5 sessions did not differ it of second 5 sessions. These results suggest that dolphins used movement cue rather than face or reaching direction.

## Community-based Conservation and Forest Management in Masindi District, Uganda: Preliminary Observation Using Camera Traps

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Population growth, farmland expansion and economic development are crucial factors that impede forest and wildlife conservation programs. In Uganda, a rapid population increase has been causing high demand on agricultural land, and many human-wildlife conflicts are reported. To solve these problems, the Ugandan government has resettled villages that were near national parks to increase land availability and maintain the protected ecological areas. In 1996, USAID and the Ugandan government resettled the village of Alimugonza, Masindi. A section of a nearby forest was designated as the Community Forest, meant to provide villagers with sustainable resources. Since the area is well known for rich agricultural land, Alimugonza has been the destination of migrants from across Uganda.

After the completion of the resettlement, there has been very limited long-term observation of how the Community Forest is being utilized and maintained by the residents of the village. Due to the population increase, the villagers have attempted to expand their crop fields and the Community Forest has become isolated from the neighboring Murchison Falls National Park. The area is also decreasing from 0.3km<sup>2</sup> in early 2000s to 0.17 km<sup>2</sup> in 2018. Crop damage from wildlife became much more common in the newly opened fields. Here I introduce the wildlife observed in and near the isolated Community Forest through direct observation and camera traps. I observed three primates, which were Anubis baboons (*Papio anubis*), Abyssinian colobi (*Colobus guereza*), and Vervet monkeys (*Chlorocebus pygerythrus*), and some other mammals and birds. Some videos strongly suggest that groups of *P. anubis* travel to and from the villagers' fields near the Community Forest. Despite the villagers' efforts to resolve the human-wildlife conflicts, a mutually beneficial resolution is difficult to find due to the close proximity of villagers' crop fields and forests, and to growing demand for agricultural land.

## **Understanding Community People's Perception of Animals Living in Protected Areas: A Case of Bwindi Impenetrable National Park, Uganda**

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Human-Wildlife conflict is one of the most major issue in wildlife conservation. Especially, crop-raiding by animals living in protected areas is major threat to community people. Estimating the actual amount of crop loss is essential as a first step for the government to deal with the issue. Understanding the community people's perception of problematic animals, however, is also very important because the former does not often correspond to the later. Thus, in the present study, community people's perception of problematic animals was studied in Bwindi Impenetrable National Park, Uganda, where the actual amount of crop loss has already been estimated before. During 7 months of fieldwork, participant observation, semi-structured interviews and focus group discussions with community people were conducted and risk map was drawn. Baboons were perceived as the most problematic animals and followed by gorillas, monkeys, bush-pigs and so on. Compared to the previous study, the overall trend was similar but gorillas received more attention by community people than the actual crop damage caused by them. This might be because crop-raiding by gorillas became more frequent than before or gorillas tend to receive more attention as gorillas were perceived as the main source of income for community people.

## Consumption of bonobo meat among Bongando ethnic group in DRCongo

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Bushmeat hunting is one of the biggest threats to the great apes in Central Africa. The Bongando ethnic group in Democratic Republic of Congo traditionally has a taboo against eating bonobos (*Pan paniscus*). The reason why Bongando avoid eating bonobo is because they believe bonobos are from same ancestors with Bongando. Also bonobos have a no tail, so bonobos are not animals but humans in Bongando's animal taxonomy.

However, researching other villages, the situation revolving around bonobos is dramatically different. This study aims to examine how local perceptions towards bonobos become diversified within and beyond the reserve.

I conducted a survey questionnaire to 961 Bongando people living in 8 villages to inquire their human-bonobo interactions. Two of the villages surveyed are from the reserve and five are from the non-protected areas. Results show that the perception towards the bonobos differed between the people from the reserve and the non-protected areas. In the reserve, bonobo research has been continued over 40 years.

People from the reserve tend to avoid eating bonobo due to their traditional beliefs and benefit from the bonobo research. The support from the bonobo research encourages the preservation of the bonobos in the reserve. Conversely, people from the non-protected areas are inclined to eat bonobo. This can be seen especially in the age group between 20 and 40. Furthermore, the availability of bonobo meat in these areas tends to be high in the villages from the non-protected areas.

According to my interviews, villagers hunt bonobos not for only sale.

This mean is villagers who hunt bonobos, and also consume bonobo meat by themself.

It is assumed that cultural interchanges have been accelerated after civil wars. Plantations around villages were collapsed, so people go to cities to get work.

The traditional taboo of bonobo is disappearing rapidly and the situation is critical in the non-protected areas.

## **Conservation through disgust and public health: Introducing a new framework**

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In a growing world of 7.7 billion people, large mammals are particularly at risk of extinction; direct killing by humans, agricultural expansion and logging being the principal causes. Consequently, this human proximity favors the emergence of infectious diseases causing additional threats to these species. Different strategies, such as the construction of protected areas, anti-poaching patrols, crop-raiding deterrents and electric fencing, as well as awareness campaigns and sanitary precautions, are used to mitigate these threats but fast declines require simultaneous policy decisions and local action. Scientists studying large, endangered mammals in their natural habitats may play a great role in bridging decision-making with applications on the ground. Here, we propose a new framework linking the adaptive system of disgust to conservation issues by focusing on eco-tourism and human-wildlife conflict. The situation at numerous field sites shows that eco-tourism can negatively impact the behavior and health of critically endangered great apes because tourists do not always respect the precautionary rules recommended by the IUCN, such as keeping a minimum distance of 7 m and wearing masks. These species, and the tourists themselves, are thereby put at greater risk of infectious disease transmission, not to mention aggression from the animals they are observing. As such, our own sense of disgust could be used in a behavioral change campaign, similar to the one used in public health through the promotion of hand-washing, by exposing eco-tourists to pictures or olfactory compounds associated with infectious diseases that could put the apes and/or themselves at risk. Such campaigns could easily be tested by observing whether the rules are better respected during the visits with and without these treatment measures. Moreover, an animal's system of disgust could also be used to mitigate human-wildlife conflict, for example by developing crops with tastes or smells that are aversive to elephants or non-human primates and thus induce a conditioned taste-aversion or olfaction-based aversion that mitigates crop-raiding. These ideas could be extended to other aspects of conservation and public health concern, and replicated at different sites with different species, taking into account the epidemiology of infection risk for each human-wildlife interface and designing adequate campaigns to combat it.

## **A visitor survey at the Kyoto City Zoo : Does environmental enrichment facilitate visitors' learning?**

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Environmental enrichment is one of the many devices used to improve the welfare of zoo animals and is being actively addressed to many zoos in recent years. Enrichment is not only beneficial for animals, but it is also said to have a positive impact on the zoo visitors. Education in the zoo is known to play a major role in promoting ex-situ conservation, and enrichment may be effective in strengthening the educational effect. However, the effect of enrichment on visitors' education has hardly been verified. Therefore, in this study, we examined whether the impression of visitors to tigers and their absorption rate of knowledge on tigers are affected by the presence of enrichment or not.

We organized an educational talk event in front of enclosures of Amur tigers twice a day between February and March 2018: at 10 AM when the tigers used enrichment, and at 2 PM when the tigers were sleeping or resting. After the event, we conducted questionnaire surveys on those who came to listen to the talk. As a control, we also conducted questionnaire surveys when there was no talk. In the questionnaire, we asked about the enrichment, the images and impressions of wild and captive tigers, ecological knowledge of tigers which was explained at the educational talk. Even though visitors listened to the same educational talk, listening while watching the tigers actually using enrichment made it easier to leave an impression, and also it increased their absorption rate of knowledge, compared to listening while watching the tigers inactive. By conducting educational activities with enrichment, it would be a catalyst for visitors to bring animal welfare and conservation consciousness.

## Genetic monitoring of the Japanese golden eagle using neutral and functional genetic loci

Annegret M Naito<sup>\*1</sup>, Yu Sato<sup>1</sup>, Taku Maeda<sup>2</sup> and Miho Inoue-Murayama<sup>1</sup>

<sup>1</sup>*Wildlife Research Center, Kyoto University, Kyoto, Japan*

<sup>2</sup>*Iwate Prefectural Research Institute for Environmental Sciences and Public Health, Morioka, Japan*

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The Japanese golden eagle (*Aquila chrysaetos japonica*) is an endangered subspecies inhabiting Japan and parts of Korea. Its population size and breeding success has been declining over the past decades due to habitat loss and poorly managed forestry practices, and it is said that the number of wild individuals is as low as 500. To reduce further heightening of extinction risk, it is crucial to maintain adequate levels of genetic diversity, as this is an important factor in avoiding inbreeding depression and its associated risks (e.g. increased susceptibility to disease and reduced adaptability to changes in the environment). Hence, it is necessary to conduct genetic studies to better inform conservation strategies of the Japanese golden eagle. Previous studies of this subspecies have focused on population genetics, such as estimating the genetic diversity of captive and wild populations, as well as simulating historical and future population sizes. We are building on currently available knowledge to progress the conservation genetics of the Japanese golden eagle. Specifically, we are using genetic markers for individual identification and population monitoring – information which can be used to track changes in population size and individual movement over time and space. Samples from wild Japanese golden eagles are provided by collaborators in the field, and those from captive individuals are given to us by zoos participating in the captive breeding program. Currently, we have produced a dataset with over 60 samples using 16 microsatellite markers and mitochondrial DNA. Analyses indicate relatively high levels of genetic variation, low degree of inbreeding, and feasibility of generating genetic profiles for individual identification using microsatellite markers. We are currently developing additional microsatellite markers to improve the precision and power of such analyses, especially for determining kinship. So far, we have developed primers for 50 markers, and are in the process of testing amplification success and polymorphisms for each. In the future we wish to expand our research to encompass functional genes. At the moment, we plan to study the genetic diversity of the major histocompatibility complex (MHC) genes, which have immunological and reproductive functions. In short, we plan to study various genetic markers to address questions which have potential implications for conservation of wild and captive Japanese golden eagles.

## Conservation genetics for the Ryukyu flying fox

Yuto Taki<sup>1\*</sup>, Christian E. Vincenot<sup>2</sup>, Yu Sato<sup>1</sup> and Miho Inoue-Murayama<sup>1</sup>

<sup>1</sup>Wildlife Research Center, Kyoto University, Kyoto, Japan

<sup>2</sup>Department of Social Informatics, Kyoto University, Kyoto, Japan

\* sakyoulemmus@gmail.com

There are 122 mammal species in Japan, and 37 of them are bats. The Ryukyu flying fox (*Pteropus dasymallus*) is one of the bat species in Japan, distributed in the Ryukyu archipelago, Taiwan, and possibly the Philippines, and is divided into 5 subspecies. They mainly eat fruits, nectar, and sometimes leaves, and has an important role in pollination and seed dispersal. Although they are listed as VU (vulnerable) in IUCN Red List, few genetic analyses have been conducted for their conservation. The purpose of this study is to evaluate genetic diversity, genetic differentiation, and gene flow of the Ryukyu flying fox between islands. At first, we conducted mtDNA haplotype analysis with the samples collected in 8 islands where one of the subspecies *P.d. yaeyamae* live. We identified 39 haplotypes in 526bp of the control region of 142 samples. 14 haplotypes were shared between some islands, and haplotype network for the 8 islands did not show any clear genetic structure. This might be because of migration between islands, but individual identification is needed to check actual gene flow. Also, some haplotypes were only found in particular islands, so there might be some genetic structure which could not be revealed by mtDNA analysis. Therefore, we developed microsatellite markers for further analyses to investigate genetic structure and gene flow between islands by identifying individuals. We designed 50 sets of primers and tested them to choose highly polymorphic markers. These markers will help us to get genetic information necessary for conservation of the Ryukyu flying fox.

## **Cryptic species in *Hipposideros diadema* (Chiroptera: Hipposideridae) from Sabah, Malaysian-Borneo**

Noor Haliza Hasan<sup>1\*</sup>, Nur Ain Awatif Mohd Kanapiah<sup>2</sup>, and Azniza Mahyudin<sup>1</sup>

<sup>1</sup> *Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah, Kota Kinabalu, Sabah, Malaysia*

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*Hipposideros diadema* or the Diadem leaf-nosed bat is a species found throughout the Southeast Asia and the Australasia region. It requires a large cave for roosting which presumably restrict its movement in general. Combination of specific ecological requirement and physical geographic barrier are major factors which lead to species evolution and speciation. A preliminary genetic data of two *H. diadema* populations from the Banggi Island, Kudat and the Gomantong Cave, Sandakan from Sabah (North Borneo) suggested a probable existence of unrecognized cryptic species within the *diadema* group of the *Hipposideros* spp. High genetic divergence (>20%) of the cytochrome *b* gene of individuals from both populations warrant further research on the *H. diadema* populations from Sabah and its adjacent islands. Phylogeny reconstruction of *H. diadema* from Sabah will benefit the state in terms of its wildlife conservation management.

## **Can female orangutans estimate male's coercive tendency by engaging intersexual food transfer?**

Tomoyuki Tajima<sup>1\*</sup> and Titol P. Malim<sup>2</sup>

<sup>1</sup> *Laboratory of Human Evolution Studies, Graduate School of Science, Kyoto University*

<sup>2</sup> *Sabah Wildlife Department, Sabah, Malaysia*

\* [tajima@jinrui.zool.kyoto-u.ac.jp](mailto:tajima@jinrui.zool.kyoto-u.ac.jp)

Transfer of food plays a key role in human social life, which is also applicable for non-human primates. To reveal the conditions favored by the evolution of food transfer, would thus be essential to understand the evolution of human sociality. This study aims to clarify which of the predictions best explains the patterns of intersexual food transfer in a free-ranging population of Bornean orangutans. We observed 90 cases of intersexual food taking attempts (FTAs), and 51 of them resulted in the successful transfer of food. My observations did not directly support food-for-food or food-for-sex reciprocal exchanges but indicated that males were more likely to tolerate females' FTAs for food transfer than the other way around. This can be interpreted as that males might utilize such food transfer interactions to make associations with females more relaxed, which may serve to increase reproductive success on a long-term basis. The proportion of males' coercive food snatching from resisting female possessors has a significant positive effect on the proportion of male's coercive genital inspections of resisting females. Given the relationship, females may be able to estimate a male's sexual coerciveness by engaging in food transfer interactions with them.

## **The understanding of body structures in chimpanzees: conspecifics and other species**

Jie Gao<sup>1</sup>\*, Masaki Tomonaga<sup>1</sup>

<sup>1</sup> *Primate Research Institute, Kyoto University, Inuyama, Aichi, Japan*

\* gao.jie.87c@kyoto-u.jp

The recognition of bodies of conspecifics' and other species' is vital for animals to live. In this study, we investigated the understanding of body structures in chimpanzees, both of chimpanzee bodies, and of bodies of other species. Previous studies have found that chimpanzees show the body inversion effect to intact chimpanzee bodies, but not to other objects, including houses. It suggests that they use configural processing for intact bodies of conspecifics.

We used scrambled chimpanzee bodies and other species' bodies with different postures to test whether they use the same way to perceive them as with intact chimpanzee bodies by examining the inversion effect. Seven chimpanzees engaged in matching-to-sample tasks on touch screens. If they chose the one that was the same as the sample out of multiple alternatives, it was a correct choice and they would get food reward. All stimuli were upright in some trials, and in other trials, all stimuli were inverted. If the accuracy in the upright trials is higher than inverted ones, then there is an inversion effect.

For the conspecifics, they showed no inversion effect for bodies with abnormal body part arrangement, and showed the inversion effect for bodies with abnormal body part proportion. It suggests that chimpanzees are more sensitive to body part arrangement when they process bodies of conspecifics.

For other species, they showed the inversion effect to the conditions of "crawling humans" and "horses", which they have never seen yet share the quadrupedal postures with them. It suggests that chimpanzees use embodied experience when processing other species. They also received two conditions with bipedal human bodies doing familiar and unfamiliar postures, and they only showed the inversion effect in the condition with familiar postures. It suggests that chimpanzees also use visual experience when processing other species. We also tested 33 preschoolers using the similar methods with the stimuli of humans, chimpanzees (that they were not familiar with), horses, and houses. They showed the inversion effect to humans, chimpanzees, and horses. Therefore, children seem to utilize the visual experience more than chimpanzees.

In summary, our study shows that chimpanzees have knowledge about the body part arrangement of conspecifics' bodies, and they use embodied as well as visual experience in processing other species' bodies. Additionally, children utilize the visual experience more in processing other species' bodies than chimpanzees.

PWS Buddha Seminar

# 環境省レンジャーの業務紹介

日時：**2019年3月3日（日）**  
**14:00～15:00**

会場：京都大学北部構内  
**理学研究科セミナーハウス**

言語：日本語（Language : JAPANESE）

## －内容－

『環境省レンジャーの仕事～国立公園管理を中心に～』

福島誠子（京都大学野生動物研究センター特定助教／環境省自然系技官）

『霞ヶ関での2年間』

田和優子（環境省自然環境局野生生物課希少種保全推進室）

会場位置図



質疑応答の時間もあります。  
気軽にご参加ください！



主催：京都大学 霊長類学・ワイルドライフサイエンス・リーディング大学院

Theme of the conference :

Learning from the Wild:

Animal Welfare,

Conservation and Education

in Harmony



Japanese macaque / Photo by Aki Toyoda

# The 14<sup>th</sup> International Conference on Environmental Enrichment

22-26 June, 2019, KYOTO JAPAN

Conference Venue :

Clock tower, Kyoto University, Kyoto, Japan

For registration and abstract submission, visit our website!

<https://www.iceekyoto.org/>



Meet the animals in Japan Post-congress tour opportunities (27th June -) :

Japan Monkey Centre & Primate Research Institute, Kyoto University (Inuyama, Aichi)

Kumamoto Sanctuary, Kyoto University (Uki, Kumamoto) / Koshima Island (Kushima, Miyazaki) / Yakushima Island (Kumage, Kagoshima)

Correspondence :

[iceekyoto2019@iceekyoto.org](mailto:iceekyoto2019@iceekyoto.org)



Host organizations



Leading Graduate Program in Primatology and Wildlife Science, Kyoto University

Kyoto City Zoo / Japan Monkey Centre / SHAPE-Japan / International Core of Excellence for Tropical Biodiversity Conservation focusing on Large Animal Studies



## プログラム紹介

# 霊長類学・ワイルドライフサイエンス・リーディング大学院(PWS)

霊長類学・ワイルドライフサイエンス・リーディング大学院(PWS)では、京都大学の基本目標である地球社会の調和ある発展に向け、現場力、世界を相手に地球社会の未来をデザインする能力、ならびに我が国の海外展開に欠かせない俯瞰力と国際性に富むリーダーを養成します。

霊長類学は日本発の、そして日本が世界を牽引する稀有な学問であり、近年、霊長類学を基盤にし、大型の絶滅危惧種を対象にした「ワイルドライフサイエンス」という新興の学問分野が確立されつつあります。そこで必要とされているのは、フィールドワークを基盤として、人間のこころ・からだ・くらし・ゲノムを包括的に理解しつつ、「地球社会の調和ある共存」を目指す実践活動です。

学問としては最先端を担っているが、欧米にあって日本に明確に欠けているものが3つあります。(1)生物保全の専門家として国連や国際機関・国際NGO等で働く若手人材、(2)博物館・動物園・水族館等におけるキュレーター、および、生息地で展開する博物館動物園としての「フィールドミュージアム」構想の具現者、(3)長い歳月をかけて一国を対象としたアウトリーチ活動を担う実践者。これら日本が抱える3つの欠陥を逆に伸ばし、ろと考えます。研究・教育・実践の新たな展開の場と捉え、学問と実践をつなぐグローバルリーダーの育成を目指します。

プログラムの詳細はHP (<http://www.wildlife-science.org/>) を参照してください。



1

絶滅危惧種保全の専門家として国連や国際機関・国際NGO等で働く若手人材

目に見える国際貢献: 専門性・語学力・フィールドワーク経験を持つ人材を輩出



2

博物館・動物園・水族館等のキュレーター(博士学芸員)

専門的知識・経験を発揮し、社会に貢献するキャリアパス



3

長い歳月をかけて一国を対象としたアウトリーチ活動を担う実践者

京都大学のフィールドワークの伝統と蓄積: 現地目線でニーズを発信、日本の具体的貢献を提言できるリーダー

同窓運営組織を作って相互交流・連携と次世代育成を図る

### 国際性を身につけた実践者の育成カリキュラム

プログラム運営委員

担当教員

- ◆フィールドワーク実習
  - 国内フィールドワーク実習
  - 海外フィールドワーク実習
- ◆野外研究の基礎となる学問の習得

- ◆国際連携機関との交流
- ◆国内実験施設での研修
- ◆語学

外部評価委員会

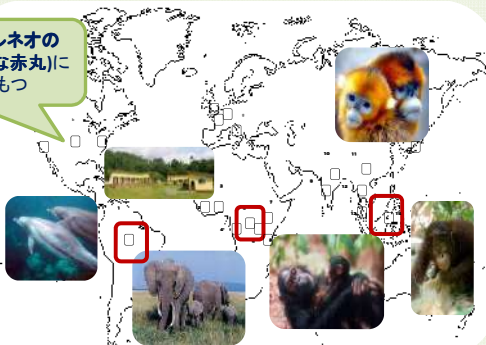
国際連携機関

グローバル30プログラムでの実績がある英語での入試・教育・学位授与

◆理学研究科生物科学専攻の8月試験(4月入学)の通常入試 ◆平成21年から実施済の春秋入学の国際入試: 外国籍の者だけ受験

#### 海外フィールドワーク拠点と連携協定の締結先

アマゾン・コンゴ・ボルネオの世界3大熱帯林(大きな赤丸)に研究教育拠点をもち



#### フィールド実習のための国内拠点



### 霊長類学・ワイルドライフサイエンス・リーディング大学院を履修するには

霊長類学・ワイルドライフサイエンス・リーディング大学院(PWS)は、5年一貫教育プログラムです。大学院修士1年生(M1)から履修を認められた者をL1とし、L2、L3、L4、L5と進級し、5年間で修了します。PWSは、従来の大学院課程と並行して進むプログラムであり、履修することによって現在の所属先を変更する必要はありません。本プログラムを履修するためには、次の条件がどちらも必須です。

#### 1. 京都大学の大学院生であること:

理学研究科生物科学専攻の大学院生になる必要があります。なお、他の研究科の大学院生はお問い合わせください。

#### 2. 本プログラムの履修を申請し認められること:

日本人も外国人も同じ手続きです。なお履修対象者は、その時点での修士1年生(L1生と呼びます)か、いわゆる博士課程からの編入生(L3生と呼びます)を対象にします。例年1月中旬に次年度の履修生の募集要項を公開し、3月上旬に試験を実施します。秋入学者は日程が異なります。



# カリキュラム

## 霊長類学・ワイルドライフサイエンス・リーディング大学院(PWS)

霊長類学・ワイルドライフサイエンス・リーディング大学院(PWS)が、生物科学専攻・霊長類研究所・野生動物研究センターとも協同して提供するカリキュラムの内容と日程を紹介します。必修科目の実習は、理学研究科の正式科目として登録されています。なお、実施日時に変更する場合があります。詳細は<http://www.wildlife-science.org/ja/curriculum/>を参照してください。

PWSの履修やカリキュラムの内容に関する問い合わせは[info@wildlife-science.org](mailto:info@wildlife-science.org)までどうぞ。

### 必修科目 最初の2年間で必ず履修する「修士課程相当分」



#### ◎インターラボ

京都市動物園・生態学研究センター・原子炉実験所・瀬戸臨海実験所・霊長類研究所・日本モンキーセンターを回り、生物科学専攻における広範囲な研究領域の概略を学びます。

2018/04/03-08



#### ◎幸島実習

日本の霊長類学の発祥の地である宮崎県幸島において、天然記念物である幸島の野生ニホンザルを観察して、糞の採集から食物となった植物を同定するなど、各自がくふうしたテーマで研究を行い、野外研究の基礎を学びます。

霊長類研究所: 2018/04/22-28  
野生動物研究センター:  
2018/05/06-12



#### ◎屋久島実習

世界遺産の島・屋久島で、海外の学生との研究交流も兼ねて、タンザニア、インド、マレーシアの大学院生とともに英語を公用語としたフィールドワークを行います。採取した試料は、続いて行われるゲノム実習で使われます。

前期: 2018/05/19-26  
後期: 2018/11/3-9



#### ◎ゲノム実習

屋久島で採取した試料を使って、実験と解析を行います(初心者コース/次世代シーケンサーを駆使した高度なコース)。屋久島実習に引き続き参加する海外の大学院生を交えて、実習の公用語は英語です。フィールドでのサンプリングと、それに続くゲノム分析を通して経験することで、フィールドワークもラボワークも行える研究者を養成します。得られた成果をもとに、最終日には国際シンポジウムでポスター発表(英語)を行います。

前期: 2018/05/28-06/01  
後期: 2018/11/12-16



#### ◎動物園/博物館実習

PWSの学外連携施設日本モンキーセンターにおいて、キュレーター・飼育技術員を講師としたレクチャーを受け、現場で飼育実習を行い、教育普及活動にも参加します。PWSの3つの出口のうちのひとつである「博士学芸員」の仕事について学ぶとともに、霊長類及びワイルドライフサイエンスの環境教育の実践に触れます。

前期: 2018/07/07-09  
後期: TBD (2018/02/08-10)



#### ◎比較認知科学実習/動物福祉実習

比較認知科学研究の基礎を学ぶために、チンパンジー(霊長類研究所=PRI: 比較認知科学実習)とボノボ(熊本サテライト=KS: 動物福祉実習)を対象とした認知実験や行動観察の手技を習得します。PRIでは、霊長類とは異なる環境に適応してきた有蹄類であるウマについてもその行動観察を行います。

PRI: 2018/09/10-12  
KS: 2018/10/23-26



#### ◎笹ヶ峰実習(無雪期/積雪期)

京都大学笹ヶ峰ヒュッテ(新潟県妙高市: 標高1300mの高原)において、生物観察や火打山(標高2462m)登山や夜間のビバーク体験(戸外での緊急露営)を通して、フィールドワークの基礎となるサバイバル技術を学びます。

無雪期: 2018/07/17-20  
積雪期: 2019/03/16-20



#### ◎自主フィールドワーク実習

自主企画の海外研修を行うことで、履修生の自発的なプランニング能力の向上を図り、出口となる保全の専門家や、キュレーターや、アウトリーチ活動の実践者の育成につなげます。

各自で企画

#### 2017年度実施例:

- 2017/08/01-10/01 (L1@ウガンダ): 野生アフリカゾウの生息地利用および食性調査
- 2017/05/11-08/06 (L2@ポルトガル): ポルトガルにおける半野生ウマの行動研究
- 2017/02/01-07/21 (L4@コンゴ): 野生ボノボのメスの移籍に関する発達の要因および社会・生態学的要因の研究
- 2017/02/16-06/21 (L4@インド): Vocal communication in Asian elephants
- 2017/05/08-09/11 (L4@タンザニア): タンザニアのカタビ国立公園におけるキリンの調査

学生の自主企画の集団実習も多数実施しています

- 地獄谷・高崎山実習
- キッズジャンボリー@東京フォーラム
- 小豆島実習
- 知床シャチ実習
- サンフランシスコ実習



### 選択科目 最後の3年間で必ずこのうちの1つを履修する「博士課程相当分」



#### ◎保全生物学研修

国連・国際機関・NGO等での研修



#### ◎動物福祉学研修

博物館・動物園・水族館等での研修



#### ◎アウトリーチ活動研修

一国を対象としたアウトリーチ活動の研修



#### ◎ブッダ・セミナー

WWF職員・大使・知事などの多様な講師陣によるセミナーを随時開催しています。公用語は定めていません。



#### ◎アシュラ・セミナー

英国・コンゴ・ブラジル・ブータンなどからの研究者・政府関係者を講師として、公用語が英語のセミナーを随時開催しています。

### 語学 「自学自習」「現地習得」を支援



母語以外の多言語学習を推奨します。なお、英語は必修で英語が母語のばあいは最低ひとつの他言語が必修です。その他の言語習得についても強く推奨します。

### 国際シンポジウム

霊長類学・ワイルドライフサイエンス・国際シンポジウム  
The International Symposiums on Primatology and Wildlife Science

- 第1回: 2014/03/06-09
- 第2回: 2014/08/29-30
- 第3回: 2015/03/05-08
- 第4回: 2015/07/21-22
- 第5回: 2016/03/03-06
- 第6回: 2016/09/12-15
- 第7回: 2017/03/02-05
- 第8回: 2017/09/26-28
- 第9回: 2018/03/03-05
- 第10回: 2018/09/22-24
- 第11回: 2019/03/01-03



The Leading Graduate Program in Primatology and Wildlife Science (PWS) strives to realize global well-being. The program aims to foster individuals with the ability to make quick judgements about environmental issues and to design a future global society, while at the same time nurturing leaders indispensable for global action.

Japanese primatology has played a leading role in this unique academic endeavor. During recent years, the field of “Wildlife Science”, which targets endangered species research, has begun to emerge. **With fieldwork as its foundation, the fundamental aims of this field are a comprehensive understanding of the human mind, body, life and genome, as well as hands-on activities that target the well-being of the world.**

While on the frontlines of academic research, wildlife science in Japan lacks three important careers that already exist in the West: **(1) Conservation specialists with international organization, such as the United Nations and other NGOs; (2) Curators of museums, zoos, aquariums, and similar institutions, particularly those that can develop and/or expand museums or zoos as a “field museums” in a specific habitat; and (3) Dedicated individuals that invest great lengths of time in outreach activities in specific countries and societies, the so-called “boots-on-the-ground” approach.**

While providing a foundation for new research, education and hands-on experience, this program aims to nurture global leaders whose accomplishments grow hand-in-hand with the larger academic field. For further details on the program, please refer to our HP.

(<http://www.wildlife-science.org/>)



1

**Conservation specialists of international organization(s) such as the United Nations and NGO**

**Significant international contributions:**  
Produce an individual that acquires expertise, high linguistic skills, and experience in fieldwork



2

**Curator (Zoo, Museum, Aquarium, and the like) (Ph.D. level curator)**

**A career path in specialized knowledge, demonstrating one's experiences, and contributing to society**



3

**Outreach workers investing a great length of time in outreach activities in a specific country and society**

**Expanding Kyoto University's tradition:**  
Identifying the needs through on-site field of view; a leader who can propose significant contributions to Japan

**To enhance a connection with the next generation by creating an organization that facilitates a mutual relationship**

PWS Core Staff Members / Collaborators

Supervisors / Mentors

**The curriculum of a practitioner that acquired “internationality”**

◆ Hands-on fieldwork  
Domestic fieldwork  
International fieldwork

◆ Acquiring the skills / Knowledge that becomes the foundation for fieldwork

◆ Relationship with International Organizations

◆ Training at domestic facilities  
◆ Language Learning

External Evaluation Committee

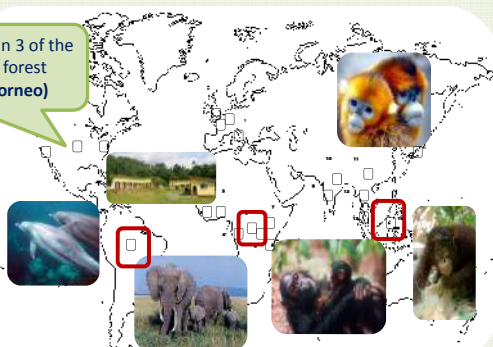
International Organizations

**English achievements received by entrance exam, education, and degree through the “Global 30” Project**

◆ General admission to the Division of Biological Science, Graduate School of Science, Kyoto University (Entrance exam in August, Enrollment in April)  
◆ International enrollment from Spring and Fall of 2009: entrance exam for foreign students only

**Facilities for International Collaborations**

We have field stations in 3 of the largest tropical rain forest (Amazon, Congo, Borneo)



**Domestic Facilities for Fieldwork Courses**



### The enrollment process of the Leading Graduate Program in Primatology and Wildlife Science

The Leading Graduate Program in Primatology and Wildlife Science (PWS) is a 5-year program. Students approved to join the PWS program from their first year of Master's program will progress from L1, L2, L3, L4, L5, and will complete the program in 5 years.

**The PWS program is completed by students parallel to their existing Kyoto University master's and doctoral programs. Therefore, students do not need to change their supervisor or section/laboratory to join PWS.** However, there are **two necessary conditions** for eligibility:

#### 1. A graduate student of Kyoto University:

It is required to become a graduate student of the Division of Biological Science, Graduate School of Science (Kyoto University). However, we are in the process of adjustment for students of other graduate departments to enroll in our program, so please do not hesitate to inquire.

#### 2. To apply and receive approval to enroll into our program:

The process is the same for both Japanese natives and foreign students. Eligible students: 1<sup>st</sup> year Master's students (will be called L1 student), or a doctoral students (will be called L3 student). Annually, we will disclose the guidelines for applicants in mid-January, and administer the entrance exam in the beginning of March. The schedule for October-enrolled students is different. (<http://www.wildlife-science.org/index-en.html>)



# Curriculum

## Leading Graduate Program in Primatology and Wildlife Science (PWS)

The following contents show the curriculum and schedule that the Leading Graduate Program in Primatology and Wildlife Science offer. Credits obtained through the mandatory courses can also be used as credit for Graduate School of Science, Kyoto University.

NOTE: Course schedules are subject to change. For more information, refer to the following site: <http://www.wildlife-science.org/en/curriculum/>

Please contact the following e-mail address for any questions about the curriculum of PWS: [info@wildlife-science.org](mailto:info@wildlife-science.org)



### MANDATORY COURSES (corresponds to Master course)



#### ◎Interdepartmental Exchange "Inter-lab"

To obtain a general idea of the diverse areas of study in the Division of Biological Science, Kyoto University. Visit the following facilities in succession: Kyoto City Zoo, Center for Ecological Research (KU), Research Reactor Institute (KU), Seto Marine Biological Laboratory (KU), Primate Research Institute (KU), Japan Monkey Centre

Apr. 3<sup>rd</sup>–8<sup>th</sup>, 2018



#### ◎KOSHIMA Field Science Course

To learn the basis of wildlife research. Conduct observation on wild Japanese macaques (protected species) in Koshima, the birthplace of Japanese primatology. Required to develop independent research topic (e.g., Identification of food items in feces)

PRI: Apr. 22<sup>th</sup>–28<sup>th</sup>, 2018  
WRC: May 6<sup>th</sup>–12<sup>th</sup>, 2018



#### ◎YAKUSHIMA Field Science Course

To learn the basis of wildlife research. Conduct fieldwork on animals/plants in Yakushima, a UNESCO World Heritage Site. English is the official language in this course to facilitate exchange of ideas with international participants, e.g. from Tanzania, India, Malaysia and elsewhere. Samples collected during the course will be used in the following Genome Science Course.

Spring: May 19<sup>th</sup>–26<sup>th</sup>, 2018  
Fall: Nov. 3<sup>rd</sup>–9<sup>th</sup>, 2018



#### ◎Genome Science Course

Complementary to the Yakushima Field Science Course. Designed for participants who expect to engage in both laboratory work and fieldwork. Beginner (direct sequencing) and advanced (next generation sequencing) courses are available. English is the official language as in the previous course. The samples from Yakushima will be used to perform various experiments and analyses. Students give a poster presentation at the international symposium scheduled on the last day of this course.

Spring: May 28<sup>th</sup>–June 1<sup>st</sup>, 2018  
Fall: Nov. 12<sup>th</sup>–16<sup>th</sup>, 2018



#### ◎Zoo/Museum Course

To obtain practical experience in environmental education in the field of primatology/wildlife science as well as to learn to work as a curator, one of the three exit points of the PWS program. This course provides lectures by zoo technicians and practical training as zookeepers.

Place: Japan Monkey Centre

Spring: Jul. 7<sup>th</sup>–9<sup>th</sup>, 2018  
Fall: TBD(Feb. 8<sup>th</sup>–10<sup>th</sup>, 2018)



#### ◎Comparative Cognitive Science Course / Animal Welfare Course

To learn the basis of comparative cognitive science. Understand the procedures in cognitive experimentation and behavioral observation. Work with:

- Chimpanzees & Horses (Primate Research Institute): Comparative Cognitive Science Course
- Bonobos (Kumamoto Sanctuary): Animal Welfare Course

Comparative Cognitive Course:  
Sep. 10<sup>th</sup>–12<sup>th</sup>, 2018  
Animal Welfare Course:  
Oct. 23<sup>rd</sup>–26<sup>th</sup>, 2018



#### ◎ SASAGAMINE Field Science Course

(Non-snow season / Snow Season)

To learn survival skills as the basis for future fieldwork. Activities include:

- Wildlife observation
- Climbing Hiuchi Mountain (2,420m)
- Night-time bivouac practicum (improvised encampment)

Place: Kyoto University Sasagamine Hütte (cabin) in Myoko-kogen (plateau at 1,300m elevation), Niigata Prefecture

Non-snow Season:  
Jul. 17<sup>th</sup>–20<sup>th</sup>, 2018  
Snow Season:  
Mar. 16<sup>th</sup>–20<sup>th</sup>, 2019



#### ◎Fieldwork (designed by each PWS student)

To develop skills in planning projects aimed at one or more of the three exit points (goals) of the PWS program (i.e., conservation specialization, curation, outreach). Required to design/conduct individual overseas training projects.

Many group fieldworks are designed by Students.

- JIGOKUDANI/TAKASAKIYAMA
- Kids Jamboree@ TOKYO
- SHODOSHIMA
- SHIRETOKO (Killer Whale)
- San Francisco



#### EXAMPLES (Academic Year 2017):

Aug. 1<sup>st</sup>–Oct. 1<sup>st</sup>, 2017 (L1@UGANDA):  
Monitoring the lifestyle of African elephants in the Kibale National Park, Uganda  
Feb. 1<sup>st</sup>–Jul. 21<sup>st</sup>, 2017 (L4@DRCONGO):  
A sex difference of mother offspring relationships in bonobo patrilineal societies  
Feb. 16<sup>th</sup>–June 21<sup>st</sup>, 2017 (L4@INDIA):  
Vocal communication in Asian elephants  
May 8<sup>th</sup>–Sep. 11<sup>th</sup>, 2017 (L5@Tanzania):  
Social structure and behavior of giraffe (*giraffe camelopardalis*) in Katavi National Park



### LONG-TERM INTERNSHIP TRAININGS (corresponds to Doctoral course)



#### ◎Conservation Biology Internship Training

UN-related organizations and NGOs



#### ◎Animal Welfare Internship Training

Museums, Zoos and Aquariums



#### ◎Social Outreach Internship Training

Outreach activities in specific countries and societies



### LIBERAL ARTS SUBJECTS



#### ◎Buddha Seminar

– Lectures from WWF officers, ambassadors, governors, etc.  
– Official language: not specified



#### ◎Asura International Seminar

– Lectures from researchers, government officials from the United Kingdom, Congo, Brazil, Bhutan, etc.  
– Official language: English



### LANGUAGE LEARNING "Self-Study Paradigm" "Hands-on Experience through Fieldwork"



Students are required to become proficient in at least one foreign language in addition to their native language. English is required for all students whose native language is not English. International students whose native language is English are required to master another language of their choice. Students are also strongly recommended to learn a second foreign language.



### The International Symposiums on Primatology and Wildlife Science



– The 1<sup>st</sup>: Mar. 06–08, 2014  
– The 2<sup>nd</sup>: Aug. 29–30, 2014  
– The 3<sup>rd</sup>: Mar. 05–08, 2015  
– The 4<sup>th</sup>: Jul. 21–22, 2015  
– The 5<sup>th</sup>: Mar. 03–06, 2016  
– The 6<sup>th</sup>: Sep. 12–15, 2016  
– The 7<sup>th</sup>: Mar. 02–05, 2017  
– The 8<sup>th</sup>: Sep. 26–28, 2017  
– The 9<sup>th</sup>: Mar. 03–05, 2018  
– The 10<sup>th</sup>: Sep. 22–24, 2018  
– The 11<sup>th</sup>: Mar. 01–03, 2019