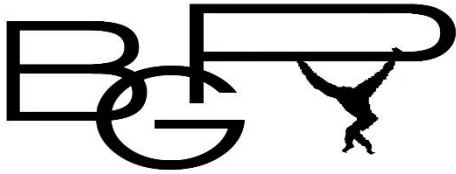


Primate Tidings



Belgian Group for Primatology

N° 41
December 2019



Belgian Group *for* Primatology

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Editor *Primate Tidings*: Frédéric de Crayencour
Layout *Primate Tidings* and logo: Birgen Meuleman

For people with an interest in the study of primates

Primate Tidings will appear two times per year.

Subscriptions: To subscribe to *Primate Tidings* and to become a BGP member, please deposit 15 euro (non-student) or 7 euro (student) into the account of the Belgian Group for Primatology: BE68-0013-3758-4934 (BIC: GEBABEBB). Add your name and postal address.

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Cover: Pileated gibbon, crowned gibbon (*Hylobates pileatus*), Branféré France
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BELGIAN GROUP *for* PRIMATOLOGY

Editorial

Dear BGP members,

Here is your new issue of “Primate Tidings”!

In this new issue, you will find many abstracts from the most recent meeting of the Belgian Group for Primatology, from the most recent congress of the Francophone Society of Primatology (SFDP) and from recent publications, as well as interesting news! Régine will address this issue’s highlights in her “Corner”.

I particularly recommend you to read an interesting new book entitled “Primates in Flooded Habitats – Ecology and Conservation” (Cambridge University Press, 2019). This pioneering volume examines primates that live in flooded habitats – ecologically-rich and highly threatened areas that are often overlooked. Leading experts in the field cover these primates’ fossil history and current biology, and set out future research and conservation priorities.

Have a pleasant reading of your “Primate Tidings”!

FRÉDÉRIC CLEENEWERCK DE CRAYENCOUR

President's Corner

In October 2019, the Francophone Society of Primatology (SFDP) held its congress in Branféré Animal Park, South of Bretagne (Morbihan, France). The theme was entitled “Which audiences for Primatology?”. There were 45 oral communications and posters. About a hundred motivated participants were able to share their primatological experiences during their stay in situ. Bertrand Deputte impressed us with his lecture reviewing the fundamentals of primatology. My sincere congratulations to Vinciane Fack, winner of the 2019 Doctoral Prize awarded by the SFDP !

An informative guided tour of the attractive park was organized, to especially observe the semi-free ranging non-human primates.

The joint meeting of the BGP and FNRS contact group “Primatology” was fruitfully held at the University of Liège on October 10, 2019. I am especially grateful to **Fany BROTCORNE** (ULiège), who contributed resourcefully and welcoming to the organization of the meeting.

The renowned invited speaker **Cédric SUEUR** (University of Strasbourg-CNRS) shed light on the complexity of analyzing primates’ social networks. **Anne LAUDISOIT** (EcoHealth Alliance, New York) amazed us with the extreme field conditions in searching for chimpanzees up and down the steep valleys of the Lake Albert rift and her video on a chimpanzee group on a ‘Lazy Sunday’. Numerous students and researchers coming from Antwerp, Brussels, Ghent and Liege presented their ongoing work competently with transmittable fervour.

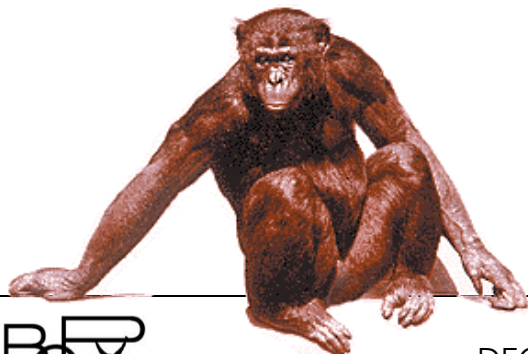
I am particularly impressed by the growing number of international collaborations between Belgian primatologists and researchers all over the world and delighted to read their publications in outstanding peer-reviewed journals.

The XXVIIIth congress of the International Primatological Society is scheduled in Quito (Ecuador) from August 16 to 21, 2020. There will be special prizes for student poster and oral presentation competition. The deadline for early bird registration and abstract submission is January 16, 2020.

They are expecting about 1,000 abstracts to be submitted. The Scientific Program Committee has about 130 members, all eager to review your abstracts. They hope to complete most, if not all reviews by March 1, 2020.

The IPS 2022 congress will be held in Kuching, Malaysia.

I wish you a primatological promising year 2 0 2 0 !



RÉGINE VERCAUTEREN DRUBBEL

Meeting of the Belgian Group for Primatology

Thanks to the commitment of Fany BROTCORNE a successful joint meeting of the BGP and the FNRS contact group “Primatology” was organized at the University of Liège on October 10, 2019.

Our invited speaker **Cédric SUEUR** unlighted the complexity of analysing the so crucial non-human social networks. **Anne LAUDISOIT**, exceptionally in Belgium, presented her fascinating search for thought to be extinct chimpanzees in the forest fragments of the Albert Lake escarpment, DRC.



CEDRIC SUEUR

*Institut Pluridisciplinaire Hubert Curien,
Université de Strasbourg-CNRS, France*



ANNE LAUDISOIT

*EcoHealth Alliance, New York;
UAntwerpen*

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Fany BROTCORNE (ULiège)
- Anthropogenic impacts on free-ranging primates: a meta-analysis on physiological stress
Olivier KAISIN (ULiège, UNESP-Sao Paulo), **L. FUZESSY**, **P. PONCIN**, **F. BROTCORNE**, **L. CULOT**
- Assessing the impact of human activities on the populations of Barbary macaques (*Macaca Sylvanus*) populating the region of Bejaia, North-East of Algeria: objectives and preliminary results
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- Comparison of the *Pan* social brain: a candidate gene approach
Nicky STAES (CRC, UAntwerpen), **P. HELSEN**, **M. EENS**, **J. M. G. STEVENS**

- Comparative psychology of positive emotions: a multi-componential approach to understand affective states in the bonobo
Daan LAMÉRIS (CRC, UAntwerpen)
- Great ape spatial distribution in anthropogenic landscapes: a case-study from south-east Cameroon
Jacob WILLIE (PGS-Cameroon, RZSA)

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- Integrative study of primate locomotion: is primate muscle function so special?
François DRUELLE (MNHN - CNRS, Paris)
- Birth control in urban macaques: description of an endoscopic tubectomy procedure and post-op monitoring
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- Using social network analysis to assess socio-behavioural differences in female macaques following sterilization
Gwennan GIRAUD (ULiège), **M.-Cl. HUYNEN**, **S. DELEUZE**, **I. NENGAH WANDIA**, **P. PONCIN**, **F. BROTCORNE**

- RESEARCH GAPS IN ANIMAL SOCIAL NETWORK ANALYSIS
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- Report on the 2019 Congress of the European Federation for Primatology (EFP) in Oxford. Announcement of the Congress of the International Primatological Society (IPS) in Quito, Ecuador
Régine VERCAUTEREN DRUBBEL (ULB)
- Closing message
Régine VERCAUTEREN DRUBBEL (ULB)

Here follow the abstracts of their scientific communications.



Mourad BOUMÉNIR
ULiège



Stefan DELEUZE
ULiège



François DRUELLE
MNHN, Paris, France

- ✓ Assessing the impact of human activities on Barbary macaque (*Macaca sylvanus*) populations in the region of Bejaia, North-east Algeria: Objectives and preliminary observations

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² *Research Unit SPHERES, University of Liège, Liège, Belgium*

³ *Department of Biological Sciences of the Environment, Faculty of Nature and Life Sciences, Abderrahmane-Mira-University, Bejaia, Algeria*

The Barbary macaque, *Macaca sylvanus*, is an endangered species submitted to high anthropogenic pressures and threats (habitat loss, inappropriate food provisioning, human-macaque conflict, tourism and illegal live trade). Currently, we know that these pressures negatively affect the health of this species, including problems related to obesity, higher stress and anxiety levels, alopecia, poor coat condition, high endoparasite diversity, and heavy metal levels. However, our understanding of the extent of these impacts remains limited and several tracks require to be further explored. This PhD project aims to investigate the anthropogenic impacts on diet, behavior and genetics of the poorly known Algerian macaque. Our first goal is to assess the impact of food provisioning on feeding behavior, fecal microbiota and rate of DNA methylation. Second, we assess the impact of human-macaque interactions on physiological stress (via fecal cortisol level) and grooming behavior. To do so, we use a comparative approach by conducting fecal sampling and behavioral data collection in three groups of macaques subjected to different levels of human pressures (interactions and provisioning) in Gouraya National Park in eastern Algeria. Here, we report preliminary observations conducted over several months in 2019 during which we were able to identify the study groups, their sleeping sites and conduct census on their demographic composition. This multi-disciplinary project is at a very early stage and we are still designing it and setting up methodologies. Our ultimate goal is to provide some currently lacking knowledge about anthropogenic impacts necessary to design appropriate and efficient management plans for conservation of these threatened populations in the Bejaia region.

- ✓ Birth control in urban macaques: description of an endoscopic tubectomy procedure and post-op monitoring

Stefan DELEUZE¹, Roland POLET², Gede SOMA³, Marie-Claude HUYNEN², Goulven RIGAUX⁴, Gwennan GIRAUD⁵, I. Nengah WANDIA³, Fany BROTCORNE²

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² *Research Unit SPHERES – University of Liège, Belgium*

³ *Faculty of Veterinary Medicine – Udayana University, Denpasar Bali, Indonesia*

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⁵ *Research Unit FOCUS – University of Liège, Belgium*

In Asia, primates and humans are increasingly forced to share space, and often enter in conflict when primates proliferate in anthropogenic environments. Reproductive control is increasingly used to limit population growth but very few monitoring data are available. Therefore, the efficiency and implications of such programs require a careful examination. Our research aims to assess the adequacy and implications of a three-year sterilization program in wild female long-tailed macaques in Ubud, Bali. Here, we describe a novel endoscopic tubectomy procedure and present the postoperative monitoring results. 137 females underwent tubectomy over four successive campaigns between 2017 and 2019, which represented 45% of the sexually mature females of the population. The survival rate of treated females was high (96%) six months after sterilization and no major postoperative complication were clinically recorded. The surgical approach was applicable for pregnant females since 26% of the treated females were pregnant at the time of the surgery and 77% of them experienced term delivery. The procedure consisted in a laparoscopic two-5mm-ports approach. The camera was introduced in the abdomen via a cannula just caudally to the umbilicus, while the bipolar forceps were inserted via a second trocar in the left flank. Both oviducts could be reached and cauterized via that same port in non-pregnant and early pregnant females. Females nearer to their term required a third port in the left flank to achieve access to the oviduct on that side as the size of the gravid uterus precluded its visualization. The laparoscopic postoperative evaluation conducted on two patients that had been neutered during a previous campaign confirmed that the oviducts were definitely disrupted and no longer potent. The duration of the laparoscopic surgery was short (mean = 15 min) and monkeys were released 03h30 in average following their capture. Overall, this study demonstrates the safety and efficiency of endoscopic tubectomy sterilization as a mean of population control in wild macaques. A demographical and behavioural monitoring is currently in progress to provide a global evaluation of the implications of such programs.

- ✓ Integrative study of primate locomotion: is primate muscle function so special?

F. DRUELLE^{1, 2, 3*}, R. LACOSTE³, P. MOLINA VILA³, G. BERILLON^{1, 3}

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Primates present a diversity of locomotor capacities including unique locomotor skills related to arboreal life. In this context, it has been proposed that muscle function of primates is particular in comparison to other quadrupedal mammals. Rearrangements of the spinal circuitry might have led these species to an increased corticospinal control of motion, thus altering the more primitive spinal mechanisms related to locomotion. Although the muscular activity of some primate species has been studied in specific static and dynamic contexts such as grasping, climbing, bipedal walking, etc, a general description of the activity pattern of a

set of extrinsic muscles during steady quadrupedal walking on the ground is missing. In the context of a large ongoing research program in Evolutionary Anthropology conducted at the Technical Platform of Motion Analysis of Primates (Primate Station of the CNRS, Rousset-sur-Arc, France), we are investigating the motor control of locomotion in primates thanks to integrative experiments. Using positive reinforcement techniques, we have trained two subadult female olive baboons, *Papio anubis*, to collaborate during EMG experiments. We have recorded the activity of six hindlimb muscles (the *gluteus medius*, the *rectus femoris*, the *biceps femoris*, the *tibialis anterior*, the *medial gastrocnemius* and the *peroneus longus*) using surface electrodes (wireless Aurion system), as well as the corresponding sagittal kinematics (spatiotemporal parameters and joint angles using video recording) while the baboons were walking quadrupedally. Our results show that, overall, the bursting patterns of these six muscles are very consistent within and between the two individuals studied. During this presentation, we discuss the general basic function of the six muscles for protracting and retracting the hindlimb during the stride, as well as their supporting and propulsive actions. We also compare our dataset with the muscular activation pattern described in other quadrupedal mammals of similar size scale, i.e. cats, dogs, rhesus macaques and lemurs. The overall similarity observed reflects the shared basic functional demands on the hindlimbs for quadrupedal locomotion in tetrapods and suggests the conservation of an ancestral neuromotor pattern in primates as well.

The present study has been funded by the IBISA platform of the CNRS (Exploration Fonctionnelle Primates) and the general project is funded by ANR-18-CE27-0010-01 and CNRS-INEE International Research Network IRN-GDRI0870.



Vinciane FACK
ULB, ANCP, UStrasbourg



Eva GAZAGNE
ULiège, KMUT-Bangkok



Gwennan GIRAUD
ULiège

- ✓ Geophagy in yellow-tailed woolly monkeys (*Lagothrix flavicauda*): a strategy to cope with dietary shifts during dry seasons

Vinciane FACK^{1, 2, 3}, Régine VERCAUTEREN DRUBBEL¹, Sam SHANEE^{2, 4}, Hélène MEUNIER^{3, 5}, Martine VERCAUTEREN¹

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⁵ Laboratoire de Neurosciences Cognitives et Adaptatives, CNRS and Université de Strasbourg, Strasbourg, France

Geophagy is the deliberate ingestion of earth materials and is documented in many animal species, including humans. It has been observed in about a quarter of non-human primate species and two major hypotheses are usually exposed to explain this behaviour. The supplementation hypothesis argues that earth consumed may provide essential minerals monkeys could not find in their diet. The protection hypothesis argues that it may protect their gastrointestinal tract from plant secondary compounds ingested, or that it may protect monkeys against endoparasites during infection's periods. We conducted the first study of geophagy in the yellow-tailed woolly monkey (*Lagothrix flavicauda*), a Critically Endangered, arboreal and little studied primate species, endemic to the north of Peru. We aimed to highlight the geophagy function by describing the behaviour and its temporal pattern, the sites used by monkeys and the earth composition, and the link with plant food resources consumed. We collected data about geophagy using focal follows and camera traps at geophagy sites during 17 months (2016-2018). Activities and plant food resources were also recorded through focal follows. We analyzed earth consumed at the Universidad Nacional La Molina in Lima, in terms of texture, pH, minerals and iron contents, following the methods of the laboratory. We used one habituated group of 24 individuals at "El Toro" study site, Peru. We recorded 121 geophagy events, 55 directly and 66 by camera traps, mostly during the dry season, when these frugivorous monkeys ate more lobes and petioles of leaves and less fruits. All age/sex individual classes practiced geophagy, in very brief events (± 15 s). They ate earth at the site or in a nearby tree. Adults used their hands to retrieve earth and juveniles used their mouth. Sites were small cavities on steep slopes, between tree roots. Earth was red and almost devoid of organic materials, and contained more clay and less minerals than the black and full of leaf debris control earth. In fact, clay is known to reinforce the digestive tract and to adsorb toxins more concentrated in non-fruit items ingested. Our results suggest that geophagy is crucial for the yellow-tailed woolly monkey's survival as this arboreal species descended to the forest floor, where the predation pressure is higher, and as each individual class performed it. It seems that earth helped them to cope with a diet richer in non-fruit items during fruit scarcity in dry seasons.

- ✓ When pigtailed macaques cannot select for optimal sleeping sites in degraded habitat
Eva GAZAGNE^{1, 2}, Dusit NGOPRASERT², Fany BROTCORNE¹, Marie-Claude HUYNEN¹, Tommaso SAVINI²

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Primates spend half of their lives in sleeping sites and should select them carefully to maximize fitness. Sleeping site selection in degraded habitat, with reduced availability and quality of resources, is therefore likely to play a leading role in primates' survival. We aimed to assess the impact of habitat degradation on sleeping site selection patterns in a troop of northern pigtailed macaques, using 3 non-mutually exclusive hypotheses: null hypothesis of random selection, predation avoidance, and food proximity. We identified 107 sleeping sites with only 15 reused sites selected at random in the Sakaerat Biosphere Reserve, northeastern Thailand. After analyzing forest structure at sleeping sites and random sites, we found a general low availability of large and tall trees. Our results show that macaques did not select sleeping sites at random; probability of site selection increased in familiar areas with a high number of stems and with emergent trees. Following the predator avoidance hypothesis, these characteristics are likely to facilitate macaques escape in case of predator attack and also to decrease predator detection at their sleeping sites. Additionally, the food proximity hypothesis seems to be the leading strategy in explaining sleeping sites selection of this degraded habitat. Macaques multiplied their sleeping sites following food distribution, and slept inside or in close proximity to their feeding area, which is likely to maximize their energy intake. Our results highlight the impact habitat degradation may have on sleeping site selection in a flexible species.

Key words: habitat degradation, sleeping site selection, predation avoidance, food resources, *Macaca leonine*

- ✓ Using social network analysis to assess socio-behavioural differences in female macaques following sterilization
Gwennan GIRAUD¹, Fanny TIBESAR¹, Fanny CLOUTIER¹, Damien BROENS¹, Sophie DELOOZ¹, Marie-Claude HUYNEN¹, Stefan DELEUSE¹, I. NENGAH WANDIA², Pascal PONCIN¹, Fany BROTCORNE¹

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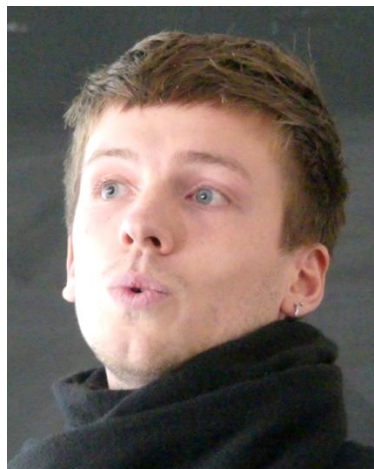
² Udayana University

In this new century, conflicts between human and primate populations are increasing and developing means of population control are urgently needed to help for the coexistence of these populations. Reproductive control by chemistry or surgery is spreading as an alternative to culling and translocation. However, we do not know much about the long-term effects of such techniques on the social dynamics of free-ranging groups of primates, especially considering the huge attractiveness of newborn infants on females' primates. The impact of the absence of progeny is a question left open. In Ubud Monkey Forest in Bali, Indonesia, a sterilization program by tubectomy under endoscopy has been launched in 2017. This technique is not influencing the ovarian function and therefore is not perturbing the secretion of sexual steroid hormones. Our study takes the opportunity of this ongoing project to assess the potential behavioural changes in sterilized female long-tailed macaques (*Macaca fascicularis*). By comparing sterilized and control females, we present preliminary results

based on two different datasets, at populational and group levels, respectively based on 428 hours of focal sampling on 36 females over 3 years and on 205 hours of focal sampling on 65 individuals from one focus group where all the reproductive individuals have been identified. First, we monitored the potential changes in sexual behaviours, sexual motivation and intrasexual competition. Second, we investigated the impacts on the social network by working on centrality metrics with the new computational technique of social network analysis. We found that sterilized females partake more on sexual and agonistic behaviours than control females, probably because they are experiencing repeated non-conceptive cycles. Moreover, the centrality of the sterilized females seems to be decreasing one year after the surgery at the populational level but deeply analysis still must be done at group level, although we saw that the dominance rank is a factor to take into account in our analysis. Further monitoring is necessary to evaluate the temporal variation in social dynamics. Ultimately, this information might help to design optimal birth control programs for wild macaques.



Olivier KAISIN
ULiège, UNESP



Daan LAMÉRIS
CRC, UAntwerpen



Hortense LE MERLE
ULB

- ✓ Anthropogenic disturbances and physiological stress in free-ranging primates: a meta-analysis

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Identifying the impact of anthropogenic disturbances on the health, survival, and well-being of species has become a key question of conservation biology. Many primate species are forest-dependent, making them particularly vulnerable to habitat change and excellent ecological indicators in tropical ecosystems. Before affecting primates at a population level, anthropogenic perturbations impact the physiology of individuals. Glucocorticoids (GC) (i.e., stress biomarkers) are metabolic hormones which mediate the energetic demands needed to overcome environmental and social challenges. Prolonged elevation of GC levels may have deleterious impacts on health and fitness by impairing reproduction, growth, and immune system activity of individuals. GC analysis is thus a precious non-invasive tool for assessing

stress in wild populations. We present a meta-analysis on the impact of anthropogenic disturbances on adrenocortical activity in primates. We also identify significant confounding factors which influence GC levels, highlight discrepancies in methods and results, and suggest advances for future research. We reviewed all current research comparing GC levels between primates inhabiting undisturbed forest and their conspecifics living in disturbed areas (24 studies, 226 comparisons). Anthropogenic disturbances were classified into six distinct categories: habitat loss, habitat degradation, ongoing logging, hunting, tourism, and human activity (e.g., mining, urbanization). We ran fixed-effect models to estimate the cumulative effect size of every disturbance category. Effect sizes were estimated by calculating Hedges' *d*. Our results indicate that habitat loss, hunting, tourism, and human activity had a negative effect with increased GC levels, indicating that primates inhabiting disturbed sites were more stressed than those in undisturbed sites. Widespread and extensive human encroachment seems to induce physiological stress responses in primates. However, it is crucial for future research to systematically control for confounding factors (e.g. diet, reproductive status, predatory pressure, seasonality) that may significantly influence GC levels and lead to misinterpretations.

- ✓ Comparative psychology of positive emotions: a multi-componential approach to understand affective states in the bonobo

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Similar to humans, emotions in animals affect their daily lives in many ways. While human studies rely on verbal reports for measuring subjective emotions, we need to apply a different approach for measuring animal emotions. The intensity of emotions has long been studied using behavioural and physiological measures, but these measures fail to identify the emotional valence. Positive emotions appear especially challenging to identify. Recent findings suggest that emotions also affect cognitive processes like attention, judgement and memory and that biases in these performances may give insight in the valence of experienced emotions. This project focuses on studying emotions in man's closest living relative: the bonobo. The bonobo is considered the most suitable model for reconstructing our last common ancestor and hence is a keystone species in studying our evolution and identifying unique human traits. Bonobos have rich emotional lives and respond to the emotions of others in strikingly similar ways as humans. However, the degree to which emotions of bonobos affect their own behaviour, physiology and cognition is currently unknown. To this extent, this project aims to apply a multi-componential approach to study emotions, specifically positive ones, in the bonobo using behavioural, physiological and cognitive measures.

- ✓ Newly-discovered population of chimpanzees in the DRC: an umbrella species and a case for a new protected area?

A. LAUDISOIT^{1,2}, N. TAGG³, J. WILLIE^{3,4}, B. NDJOKU^{5,6}, T. SCHOLIER^{2,5}, P. HUYGHE², J. ASIMONYIO ANYIO^{6,7}, J. OMATOKO^{6,7}, P. BAELO^{6,7}, J. DZ'NA⁸, C. MANDE^{6,9}, A. BADINGA RULE¹⁰, E. VERHEYEN^{2,3}, H. LEIRS²

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In Ituri province, Democratic Republic of the Congo, between 2015-2017, mammalian inventory in unexplored forest fragments of the Albert Lake escarpment revealed an isolated population of Eastern chimpanzees (*Pan troglodytes schweinfurthii*). The site was documented using 27 camera traps and line transect surveys (signs, tracks and nests - SCNC, habitat characterization and botanical inventory, level of human activities and collection of genetic material). We conducted structured interviews with locals to understand beliefs linked to primates. The three main fragments studied totalled $\pm 18.15 \text{ km}^2$ with an estimated forest loss in the period 2010–2015 of 6.11% (1.2% per year) depending on the intensity of anthropic disturbances and proximity to settlements. Interviews and direct observations revealed mammal hunting (galago) and possible funeral rites (watching the dead). We recorded an exceptionally high mammalian and primate density, including a group of 17 chimpanzees with 3 unweaned juveniles and adults with snare-caused mutilation. Camera trap footages and DNA barcoding allowed to inventorize 53 mammal species of which 2 Pholidota, 1 Cetartiodactyla, 1 Afrosoricida, 9 Carnivora, 9 Primates, 7 Chiroptera and 24 Rodentia/Insectivora species were identified. We quantified chimpanzee nest density and mammal functional diversity along five line transects (1.1–1.4 km). Chimpanzee density was high with 4.34–5.62/km² individuals due to the relict nature of the fragments and topography of the region creating reduced clustered suitable habitats. Several education and conservation actions have already been taken (community sensitization, mapping, tree planting with schoolchildren, draft of a conservation action plan) and will be discussed. RAFALE together with the Lendu plateau's Shari Reserve and the Biringi-Aru landscape habitat mosaic call for the creation of a community-managed protected "Blue Mountain reserve" to grant this unique site an official conservation status and protect its rich biodiversity.

- ✓ Study of the influence of environmental factors on habitat use by a community of chimpanzees (*Pan troglodytes verus*) during dry season in the National Park La Comoé, Ivory Coast

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Our work focuses on the influence of environmental factors on the spatio-temporal use of habitat by a community of *Pan troglodytes verus* chimpanzees (n=24 individuals), with a 65km² home range. Our study took place during the last 3 months of the dry season (from February to April 2019), in the Comoé National Park (Côte d'Ivoire), a highly fragmented habitat consisting of a mosaic of forest-savanna. Each month, we walked on 33 transects (total length of 20 km) looking for indices of chimpanzees' presence, such as nests, tools or "quasi-

direct observations” (vocalisations, faeces, footprints). We also recorded any sign of human activity, such as campsites, bullets, etc.

To study the influence of environmental variables on habitat use by the community of chimpanzees, we gathered several forest, food and weather data. We established 90 plots (total of 3.6 ha) in which we identified the different tree species (n = 1540 trees, 47 species). We carried out a monthly phenological survey of 18 tree species (n = 180) producing fruits known to be consumed by chimpanzees. In addition, daily temperatures and precipitations were recorded at the research station.

We recorded a total of 109 chimpanzee presence indices: 66 nests, 36 tools (“water” and “food” types) and seven “quasi-direct observations”. We did not find that one type of forest was preferentially used by chimpanzees during the study period. However, we found no nest in the gallery forest. Our study shows that chimpanzees in this community preferentially use large forest patches (more than 30 hectares), neglecting smaller patches. Although water was a limiting resource during our study, we did not find any difference in the average monthly distance separating the chimpanzee presence indices from the main water source (Comoé River). Nevertheless, a peak of “water dipping tool” (WDT) indices was recorded in the beginning of April, matching with the first heavy rain of the season.



Nicky STAES
UAntwerpen, CRC



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✓ Comparison of the *Pan* social brain: a candidate gene approach

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The difference in cognition between humans and apes is not simply a greater degree of general intelligence, but rather a quantitative difference in social cognition. Social cognition comprises the ability to understand and respond to social responses of others. This concept includes social skills related to self-knowledge and theory of mind, which indicates the ability to understand the emotions and behavior of a person from their perspective. In our project, we focus on our closest living evolutionary relatives: bonobos and chimpanzees. These two species diverged from the human lineage only 5-8 mya. This makes them keystone species for investigating our own evolutionary past and identifying unique human traits. Although bonobos and chimpanzees diverged from each other only 1-2 mya, they show considerable

differences in social cognition. Studies in bonobos suggest that they have higher social sensitivity and are better at tasks that require social tolerance and cooperation. However, to date very little is known about the mechanisms underlying these behavioral differences. To further our understanding of the evolutionary origins of human sociality, we study variation in candidate genes that are crucial in the regulation of the social brain. We report newly identified differences in the genes coding for the receptors for vasopressin (AVPR1A), oxytocin (OXTR), serotonin (HTR1A), dopamine (DRD2), estrogen (ER1 and ER2) and androgen (AR) based on high-resolution whole genome data for 20 unrelated bonobos and 57 chimpanzees. We examine the impact of non-synonymous nucleotide substitutions on protein function and structure, and discuss their potential relevance for reported differences in social cognition between the two species.

✓ Research gaps in animal social network analysis

Cédric SUEUR (*Institut Pluridisciplinaire Hubert Curien, Université de Strasbourg-CNRS, France*)

With the collaboration of Damien FARINE, Sebastian SOSA, David JACOBY and Mathieu LIHOREAU

The recent focus on the study of animal social networks has led to some fundamental new insights. These have spanned across fields in ecology and evolution, ranging from epidemiology and learning through to evolution and conservation. Whilst network analysis has been used to address questions about sociality, food webs, bipartite networks and more over the past decade it is now extending into a wider variety of fields such as network interconnection and the link between gene networks and the expression of adaptive behaviours.

Graph theoreticians and biologists also are continuously developing novel network analytical approaches, opening new avenues of study and thereby extending our knowledge on many biological aspects of animal behaviour and interactions. This synergy between the development of new techniques and their application within a wider diversity of disciplines and animal models is providing a solid framework for studying animal sociality. However, as with all new research directions, growing knowledge has come with many new questions and new analytical challenges.

This talk follows a joint special feature call in *Methods in Ecology and Evolution* and *Journal of Animal Ecology*.

✓ Great ape spatial distribution in anthropogenic landscapes: a case-study from south-east Cameroon

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Sympatric great apes (*Gorilla gorilla gorilla* and *Pan troglodytes troglodytes*) were used as model species to study how human presence modifies the distribution of animal species in

anthropogenic landscapes. Towards this goal, the nest locations of great apes and the distribution of habitats were determined; additionally, data on spatial features (trails, villages, a research site, and permanent rivers) and topographic data were collected. Analyses indicate that human disturbances are important predictors of the distribution of wild animals. When models were built with ecological variables only, the distribution of gorilla nests was predicted by the availability of their preferred nesting habitats, while chimpanzee nests were predicted first by elevation, followed by their preferred nesting habitats. However, when adding human settlements in the models, the major predictors of gorilla nesting changed to human features, while the major predictors of chimpanzee nesting remained elevation and the availability of their preferred nesting habitats. Great apes nested away from almost all human features. These results suggest that the long history of human presence in natural systems has modified ecosystems, and they highlight the need to consider anthropogenic variables when studying wildlife response to ecological factors. This research contributes to the definition of conservation measures for animal communities in human-dominated landscapes even where hunting is controlled. It is shown that chimpanzees may survive in human-encroached areas whenever the availability of their nesting habitat and preferred fruits can support their population, while gorillas are threatened by a certain level of human activity. These investigations provide further insights into predator-prey systems and stress the need to consider the effects of humans on animal behaviour in anthropogenic landscapes.

✓ Two methods to unveil proboscis monkey diet

Valentine THIRY^{1,2,*}, Arthur BOOM³, Danica J. STARK^{4,5}, Olivier J. HARDY³, Roseline C. BEUDELS-JAMAR², Régine VERCAUTEREN DRUBBEL¹, Senthilvel K.S.S. NATHAN⁶, Martine VERCAUTEREN¹, Benoit GOOSSENS^{4,5,6,7}

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There are numerous direct and indirect, invasive and non-invasive, methods to study diet composition of wild animals. In this study, we aimed to determine the diet of multiple proboscis monkey (*Nasalis larvatus*) groups inhabiting the riverine forests of the Lower Kinabatangan Wildlife Sanctuary (LKWS), in Sabah, Malaysian Borneo, by using two methods. First, we conducted boat-based direct observations (scan and ad libitum sampling) and identified 67 plant species consumed by the monkeys at their sleeping sites in early mornings and late afternoons. Secondly, we used the DNA metabarcoding method, based on next-generation sequencing (NGS, MiSeq Illumina) of faecal samples (n=155), using the short chloroplast sequence, the trnL (UAA) P6 loop. In addition, we built a DNA reference database with the local plants available in the LKWS. With the DNA metabarcoding approach, 100 plant taxa were detected as being consumed by proboscis monkeys. When combining feeding data from both methods, we reported a diverse dietary ecology in proboscis monkeys, with at least 89 consumed plant taxa, belonging to 76 genera and 45 families. The two methods provided congruent and complementary results, both having their advantages and limitations. Moreover, we were able to add 22 new genera as part of the diet

of this endangered colobine primate in the LKWS. To conclude, this study contributed to enhance the knowledge on the feeding ecology of proboscis monkeys. Finally, this study highlighted the significance of several plant species that should further be considered in habitat restoration plans or corridor establishment.



BGP meeting at the University of Liège



Régine VERCAUTEREN DRUBBEL
ULB, BGP

Fany BROTCORNE
ULiège, PRG

Exceptionally, our BGP meeting was combined with the photo exhibition entitled

❖ SARU – Monkeys from Japan: meeting with the snow monkeys

The photos are published in the splendid book “Saru – Singes du Japon” (Editions Issekinicho, 2016).

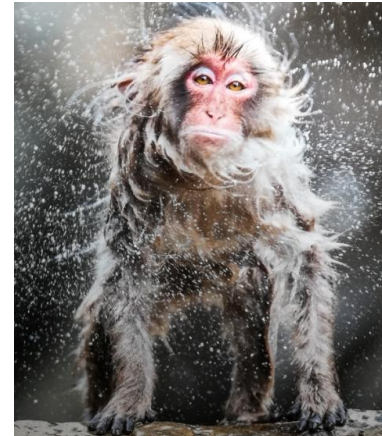
Alexandre BONNEFOY (photographer), **Marie PELÉ** (free-lance ethologist) and **Cédric SUEUR** followed the Japanese macaques (*Macaca fuscata*) across Japan during three seasons (Spring, Autumn and Winter).



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In the evening, our invited speaker **Cédric SUEUR** also gave a lecture open to the public on the theme of the exhibition:

✓ Popularisation of research on the Japanese macaque

Cédric SUEUR

Institut Pluridisciplinaire Hubert Curien, Université de Strasbourg-CNRS, France

Book project, Japan: humans and monkeys

(French collaborators: Cédric SUEUR, Marie PELÉ, Alexandre BONNEFOY; collaborators in Japan: Andrew JJ MACINTOSH, Hanya GORO, Yamato TSUJI, Hideki SUGIURA, Shiro MATSUOKA)

Whether they live in the moss-covered world heritage forests of Yakushima, at the Jigokudani site or on the very cold Shimokita peninsula, Japanese macaques stay close to human dwellings. This results in a surprising cohabitation that can be rewarding, but also problematic due to the human-wildlife conflicts it generates (Knight 1999; Honda 2009). Japanese macaques are ideal primatology research subjects, not only for the study of social structure complexity (Furuya 1957) but also to investigate the existence of cultures in animals (Kawamura 1959). Indeed, Japanese macaques display many different local behaviours: some groups make and play with snow balls (Eaton 1972), others take hot-spring baths (Zhang et al. 2007), handle stones (Huffman and Quiatt 1986) or wash their food (Kawai 1965). The general public, however, appears to be largely unaware of these behaviours, yet the home range of the snow monkey overlaps with urban zones, making human-wildlife contact a regular occurrence. To date, no specific literature was available to inform the general public

about this species. Our project aimed to resolve this situation with a book, a photographic exhibition and conferences. The project is a collaboration between researchers from the Primate Research Institute (Japan), the Department of Ecology Physiology and Ethology of IPHC-CNRS (Marie Pelé and Cédric Sueur), and Alexandre Bonnefoy from Issekinicho Editions (<http://www.issekinicho.fr/>). This project was funded by the “Investissement d’avenir” mission at the University of Strasbourg, by Ethobiosciences and Issekinicho Editions.

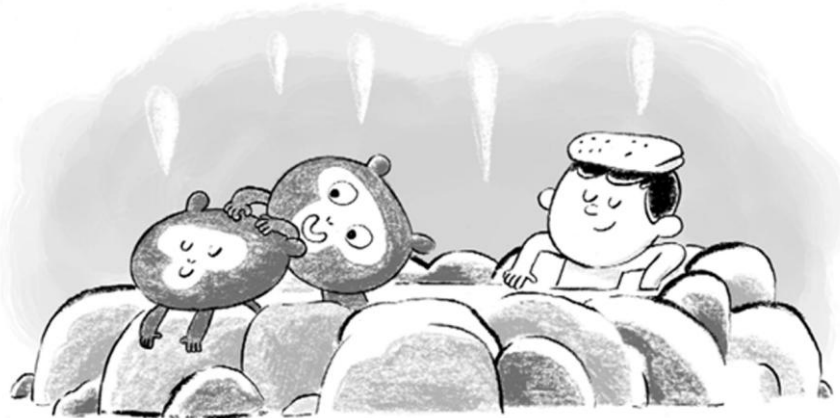


Figure 1: An example of illustrations for the book to popularize research on Japanese macaques © Alexandre Bonnefoy from Issekinicho, reprint permission obtained.

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What's Going On from Belgian Side?

PhD thesis



From left to right : **Bernard TYCHON, Pierre-Michel FORGET, Monique CARNOL, Jean-Louis DOUCET, Louis FRANÇOIS, Eliana CAZETTA, Kristel DE VLEESCHOUWER, Alain HAMBUCKERS, Nima RHAGUNATHAN**

Nima RHAGUNATHAN successfully defended her PhD thesis at the University of Liège in June 2019.

- ✓ Climate change impacts on the distribution of key tree species used by lion tamarins in the Brazilian Atlantic Forest: applications to conservation
Promoters: Alain HAMBUCKERS, Louis FRANÇOIS, Eliana CAZETTA
President of the Jury: Monique CARNOL
Jury Members: Bernard TYCHON, Kristel DE VLEESCHOUWER, Jean-Louis DOUCET, Pierre-Michel FORGET

To quote President Barack Obama, at the United Nations Climate Change Summit in 2014, “There is one issue that will define the contours of this century more dramatically than any other, and that is the urgent threat of a changing climate”. Mounting evidence has shown the impacts a changing climate has on species, flora and fauna – it can provoke changes in distributions, physiology, phenology, and behaviours, which in turn can lead to extinctions within the natural world, and a subsequent loss of ecological processes. The Brazilian Atlantic Forest (BAF), once stretching continuously from northern Brazil to northern Argentina is now heavily fragmented, and could be a portentous indicator for other ecosystems that also experience degradation. As the forest is converted, endemic fauna and flora lose their habitats, and various functions that maintained the ecosystems are also under threat. The small-bodied, endemic *Leontopithecus chrysomelas* can play a starring role in our understanding on what happens to regenerative processes in heavily defaunated and degraded forests. This thesis considers potential impacts of climate change on tree species distribution in the BAF, focused on seed dispersal and plant-animal interactions as a symptom of ecosystem functionality, and finally propose a method to incorporate seed dispersal into vegetation modelling, and use the outputs to consider how to implement various conservation and policy measures.

MaxENT (Maximum Entropy model – an ecological niche-based model) results for two future scenarios in four general circulation models suggest that up to 75% of the species risk losing more than half of their original distribution. CARAIB (CARbon Assimilation in

Biosphere dynamic vegetation model) simulations are more optimistic in scenarios with and without accounting for potential plant-physiological effects of increased CO₂, with less than 10% of the species losing more than 50% of their range. Potential gains in distribution outside the original area do not necessarily diminish risks to species, as the potential new zones may not be easy to colonise. It will also depend on the tree species' dispersal ability. This research highlights the importance of choosing the appropriate modelling approach and interpretation of results to understand key processes.

Our results from the field suggests that the dispersal behaviour and short daily-trajectories of *L. chrysomelas* (golden headed lion tamarins; GHLTs) may play a small role in regeneration of the forest because it is only a short-range disperser. Nevertheless, it probably contributes to increase the prevalence of its resource tree species locally, and thus likely to have a function in maintaining tree diversity by preventing local extinction.

In this field site, we were fortunate to have observed, sometimes only briefly, sloths, toucanets, tayras, kinkajous, hawks, various snake species (including one potentially mimicking the coral snake), and my field assistant (who had previously worked with *Sapajus xanthosternus* for 10+ years) confirmed that he heard vocalisations of the capuchins one morning. Additionally, the few evenings when the GHLTs were late arrivals to their sleeping sites, bats (unrecognisable to me at species level) were also seen flying around the trees. It was also always amusing to see beautifully intricate little frogs jumping up from puddles after rainy evenings. While defaunation and degradation are problems and must be confronted, it can be hopeful to know that even these areas can be home to the intrepid, beautiful, slithery, diversity that makes the BAF the hotspot it is.

The principal conclusion from both modelling and field work, is that conservation actions, both in the field, and at policy levels are mandatory for the conservation and functionality of the Brazilian Atlantic Forest.

Recent publications

- ✓ **Elevated neopterin levels in wild, healthy chimpanzees indicate constant investment in unspecific immune system**

Verena BEHRINGER^{1, 2, *}, Jeroen M. G. STEVENS^{3, 4}, Roman M. WITTIG^{1, 5}, Catherine CROCKFORD^{1, 5}, Klaus ZUBERBÜHLER⁶, Fabian H. LEENDERTZ⁷, Tobias DESCHNER¹
(2019) *BMC Zoology* 4:2

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Abstract: Background Ecological immunology proposes that the optimal immune defence, and the costs coming with it, vary across environments. In environments with higher pathogen load, the immune system should experience greater challenges and, therefore, investment in maintaining it should be higher. The biomarker neopterin allows monitoring of innate immune responses, and is therefore an ideal tool to investigate the effects of ecological variables on the immune system. Here, we compared urinary neopterin levels of apparently healthy chimpanzees without acute symptoms of sickness across two environments: in captivity (22 zoos) and in the wild (two populations).

Results: Our results revealed that urinary neopterin levels were nearly twice as high in wild compared to captive chimpanzees, independent of chimpanzee subspecies.

Conclusion: We conclude that wild chimpanzees experience more frequent immune challenges in comparison to captive individuals. Therefore, wild individuals have to allocate more energy to immune function and away from reproduction and growth. Our data indicate that the generally delayed development of wild animals in comparison to captive individuals might not only be related to lower energy intake but might result from greater energy allocations to immune function. Finally, our data highlight the importance of understanding immune costs for accurate characterization of energy budgets in animals.

✓ Social influence on the expression of robbing and bartering behaviours in Balinese long-tailed macaques

Fany BROTCORNE¹*, Anna HOLZNER², Lucía JORGE-SALES³, Noëlle GUNST⁴, Alain HAMBUCKERS¹, I. Nengah WANDIA⁵, Jean-Baptiste LECA⁴

(2019) *Animal Cognition* doi.org/10.1007/s10071-019-01335-5

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Abstract: Animals use social information, available from conspecifics, to learn and express novel and adaptive behaviours. Amongst social learning mechanisms, response facilitation occurs when observing a demonstrator performing a behaviour temporarily increases the probability that the observer will perform the same behaviour shortly after. We studied “robbing and bartering” (RB), two behaviours routinely displayed by free-ranging long-tailed macaques (*Macaca fascicularis*) at Uluwatu Temple, Bali, Indonesia. When *robbing*, a monkey steals an inedible object from a visitor and may use this object as a token by exchanging it for food with the temple staff (*bartering*). We tested whether the expression of RB-related behaviours could be explained by response facilitation and was influenced by model-based biases (i.e. dominance rank, age, experience and success of the demonstrator). We compared video-recorded focal samples of 44 witness individuals (WF) immediately after they observed an RB-related event performed by group members, and matched-control focal samples (MCF) of the same focal subjects, located at similar distance from former demonstrators ($N = 43$ subjects), but in the absence of any RB-related demonstrations. We found that the synchronized expression of robbing and bartering could be explained by response facilitation.

Both behaviours occurred significantly more often during WF than during MCF. Following a contagion-like effect, the rate of robbing behaviour displayed by the witness increased with the cumulative rate of robbing behaviour performed by demonstrators, but this effect was not found for the bartering behaviour. The expression of RB was not influenced by model-based biases. Our results support the cultural nature of the RB practice in the Uluwatu macaques.

Key words: social learning, response facilitation, behavioural contagion, model-based biases, material culture, token exchange

✓ Jumping in the night: an investigation of leaping activity of western tarsier (*Cephalopachus bancanus borneanus*) using accelerometers

David COSTANTINI^{1, 2, 3*}, **Manrico SEBASTIANO**³, **Benoit GOOSSENS**^{4, 5, 6, 7}, **Danica J. STARK**^{4, 5}
(2019) *Folia Primatologica* 88 (1), pp. 46-56

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Abstract: Accelerometers enable scientists to quantify the activity of free-living animals whose direct observation is difficult or demanding due to their elusive nature or nocturnal habits. However, the deployment of accelerometers on small-bodied animals and, in particular, on primates has been little explored. Here we show the first application of accelerometers on the western tarsier (*Cephalopachus bancanus borneanus*), a nocturnal, small-bodied primate endemic to the forests of Borneo. The fieldwork was carried out in the Lower Kinabatangan Wildlife Sanctuary, Sabah, Malaysian Borneo. We provide guidelines for the deployment of accelerometers on tarsiers that might also be applied to other primate species. Our collected data on 2 females show levels of leaping activity comparable to those previously described using direct observation of wild or captive individuals. The 2 females showed different patterns of leaping activity, which calls for work to explore individual differences further. Our work demonstrates that accelerometers can be deployed on small primates to acquire body motion data that would otherwise be demanding to collect using classic field observations. Future work will be focused on using accelerometer data to discriminate in more detail the different behaviours tarsiers can display and to address the causes and consequences of individual variations in activity.

- ✓ The body center of mass in primates: Is it more caudal than in other quadrupedal mammals?

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(2019) *Am J Phys Anthropol.* 169 (1):170-178

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Abstract: Objectives Whole body center of mass (BCoM) position values are lacking for a comparative sample of primates. Therefore, it still remains unknown whether the BCoM in primates is more posteriorly located than in other mammals. The aim of the present report is to provide data for a large sample of primate species and to compare the position of the BCoM in primates to non-primate mammals.

Materials and methods: We collected morphometrics on eight primate species belonging to various families: Hylobatidae (*Nomascus gabriellae*, *Nomascus Siki*), Cercopithecidae (*Cercopithecus roloway*, *Cercopithecus lhoesti*, *Colobus guereza*, *Trachypithecus francoisi*), Cebidae (*Sapajus xanthosternos*), and Atelidae (*Ateles fusciceps*). Using a geometric model, we assessed the position of the BCoM in a natural quadrupedal posture and in a control posture. To complete our comparative sample with a wider range of morphotypes, we added the data available in the literature for hominoids (*Pan paniscus*, *Pan troglodytes*, *Gorilla gorilla*, *Pongo pygmaeus*, *Hylobates lar*) and another cercopithecoid species (*Papio anubis*). We also evaluated the phylogenetic signal of the position of the BCoM in primates.

Results: The variation in the position of the BCoM in primates is very large, ranging from 40% of the distance between the hip and the shoulder in *Ateles fusciceps* to 63% in *Hylobates lar*. We observed a strong phylogenetic signal for this trait: hominoid species, as well as the baboon, have a cranial BCoM relative to the midline between the hip and the shoulder, arboreal cercopithecoids and the spider monkey have a caudal BCoM, and the capuchin monkey has a BCoM positioned at mid-trunk. The variation observed in non-primate quadrupedal mammals lies inside the variation range of primates, from 51% in *Felis catus* to 63% in *Canis familiaris*.

Discussion: The BCoM of primates is not more posteriorly located than in other quadrupedal mammals; however, there is a substantial range of variation in primates, from caudal (in arboreal quadrupeds) to cranial (in hominoids and terrestrial quadrupeds) positions. This variation is related to a phylogenetic model that suggests stabilizing selection for this trait. It seems that the BCoM position mostly depends of the size of the appendicular system (i.e., limbs) and the tail. Therefore, it may also reflect a general trend in quadrupedal mammals with arboreal species exhibiting a caudal BCoM and terrestrial species exhibiting a cranial BCoM. These results are discussed in the context of the locomotor evolution of primates including locomotor habits and gait mechanics. We also propose a new “passive” mechanism for the explanation of the particular weight support pattern observed in primates with tails.

- ✓ A brief account of human evolution for young minds
Théophile GODFRAIND¹, Régine VERCAUTEREN DRUBBEL²
(2019) *Frontiers for Young Minds* 7:22

Full-text available on line: <https://kids.frontiersin.org/article/10.3389/frym.2019.00022>

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Abstract: Most of what we know about the origin of humans comes from the research of paleoanthropologists, scientists who study human fossils. Paleoanthropologists identify the sites where fossils can be found. They determine the age of fossils and describe the features of the bones and teeth discovered. Recently, paleoanthropologists have added genetic technology to test their hypotheses. In this article, we will tell you a little about prehistory, a period of time including pre-humans and humans and lasting about 10 million years. During the Prehistoric Period, events were not reported in writing. Most information on prehistory is obtained through studying fossils. Ten to twelve million years ago, primates divided into two branches, one included species leading to modern (current) humans and the other branch to the great apes that include gorillas, chimpanzees, bonobos, and orangutans. The branch leading to modern humans included several different species. When one of these species known as the Neanderthals inhabited Eurasia, they were not alone; *Homo sapiens* and other *Homo* species were also present in this region. All the other species of *Homo* have gone extinct, with the exception of *Homo sapiens*, our species, which gradually colonized the entire planet. About 12,000 years ago, during the Neolithic Period, some (but not all) populations of *H. sapiens* passed from a wandering lifestyle of hunting and gathering to one of sedentary farming, building villages and towns. They developed more complex social organizations and invented writing. This was the end of prehistory and the beginning of history.



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✓ Advancing conservation planning for western chimpanzees using IUCN SSC A.P.E.S.—the case of a taxon-specific database

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(2019) *Environmental Research Letters* 14: 064001

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Abstract: Even though information on global biodiversity trends becomes increasingly available, large taxonomic and spatial data gaps persist at the scale relevant to planning conservation interventions. This is because data collectors are hesitant to share data with global repositories due to workload, lack of incentives, and perceived risk of losing intellectual property rights. In contrast, due to greater conceptual and methodological proximity, taxon-specific database initiatives can provide more direct benefits to data collectors through research collaborations and shared authorship. The IUCN SSC Ape Populations, Environments and Surveys (A.P.E.S.) database was created in 2005 as a repository for data on great apes and other primate taxa. It aims to acquire field survey data and make different types of data accessible, and provide up-to-date species status information. To support the current update of the conservation action plan for western chimpanzees (*Pan troglodytes verus*) we compiled field surveys for this taxon from IUCN SSC A.P.E.S., 75% of which were unpublished. We used spatial modelling to infer total population size, range-wide density distribution, population connectivity and landscape-scale metrics. We estimated a total abundance of 52 800 (95% CI 17 577–96 564) western chimpanzees, of which only 17% occurred in national parks. We also found that 10% of chimpanzees live within 25 km of four multi-national “development corridors” currently planned for West Africa. These large infrastructure projects aim to promote economic integration and agriculture expansion, but are likely to cause further habitat loss and reduce population connectivity. We close by demonstrating the wealth of conservation-relevant information derivable from a taxon-specific database like IUCN SSC A.P.E.S. and propose that a network of many more such databases could be created to provide the essential information to conservation that can neither be supplied by one-off projects nor by global repositories, and thus are highly complementary to existing initiatives.

✓ Small neotropical primates promote the natural regeneration of anthropogenically disturbed areas

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(2019) *Scientific Reports* 9:10356

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Abstract: Increasingly large proportions of tropical forests are anthropogenically disturbed. Where natural regeneration is possible at all, it requires the input of plant seeds through seed dispersal from the forest matrix. Zoochorous seed dispersal – the major seed dispersal mode for woody plants in tropical forests – is particularly important for natural regeneration. In this study, covering a period of more than 20 years, we show that small New World primates, the tamarins *Saguinus mystax* and *Leontocebus nigrifrons*, increase their use of an anthropogenically disturbed area over time and disperse seeds from primary forest tree species into this area. through monitoring the fate of seeds and through parentage analyses of seedlings of the legume *Parkia panurensis* from the disturbed area and candidate parents from the primary forest matrix, we show that tamarin seed dispersal is effective and contributes to the natural regeneration of the disturbed area.

- ✓ Fishing for iodine: what aquatic foraging by bonobos tells us about human evolution
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Abstract: Background Expansion of brain tissue and development of advanced cognitive skills are characteristic traits of human evolution. Their emergence has been causally linked to the intake of nutrients that promote brain development and iodine is considered a critical resource. Rich sources of iodine exist in coastal areas and evolutionary scenarios associate the progressive development of brain size and cognitive skills to such landscapes. This raises the question of how early hominins living in continental areas could have met their iodine requirements. One way to explore this question is to use information from hominoid primates as a proxy for the nutritional ecology of early hominins. Bonobos are particularly interesting in this context as they are restricted to the central part of the Congo basin, an area considered to be iodine deficient based on human standards.

Methods: Pooled samples of fruit, terrestrial and aquatic herbs were used to assess mineral content with an inductively coupled plasma optical emission spectrometer. Iodine content was measured with the catalytic technique of Sandell-Kolthoff and two separate inductively coupled plasma mass spectrometry methods.

Results: Nutritional analyses revealed that the mineral content of aquatic herbs is higher than in other plant foods. Moreover, two species of aquatic herbs consumed by bonobos contain iodine concentrations that are almost equivalent to marine algae.

Conclusions: These data challenge the general notion that the Congo basin is iodine deficient and demonstrate that its lowland forest offers natural sources of iodine in concentrations high enough to prevent iodine deficiency in hominoids and humans.

- ✓ Why intergroup variation matters for understanding behaviour

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(2019) *Biology Letter* 15

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Abstract: Intergroup variation (IGV) refers to variation between different groups of the same species. While its existence in the behavioural realm has been expected and evidenced, the potential effects of IGV are rarely considered in studies that aim to shed light on the

evolutionary origins of human socio-cognition, especially in our closest living relatives—the great apes. Here, by taking chimpanzees as a point of reference, we argue that (i) IGV could plausibly explain inconsistent research findings across numerous topics of inquiry (experimental/behavioural studies on chimpanzees), (ii) understanding the evolutionary origins of behaviour requires an accurate assessment of species' modes of behaving across different socio-ecological contexts, which necessitates a reliable estimation of variation across intraspecific groups, and (iii) IGV in the behavioural realm is increasingly likely to be expected owing to the progressive identification of non-human animal cultures. With these points, and by extrapolating from chimpanzees to generic guidelines, we aim to encourage researchers to explicitly consider IGV as an explanatory variable in future studies attempting to understand the socio-cognitive and evolutionary determinants of behaviour in group-living animals.

✓ A comparative study of litter size and sex composition in a large dataset of callitrichine monkeys

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Abstract: In many birds and mammals, the size and sex composition of litters can have important downstream effects for individual offspring. Primates are model organisms for questions of cooperation and conflict, but the factors shaping interactions among same-age siblings have been less-studied in primates because most species bear single young. However, callitrichines (marmosets, tamarins, and lion tamarins) frequently bear litters of two or more, thereby providing the opportunity to ask whether variation in the size and sex composition of litters affects development, survival, and reproduction. To investigate these questions, we compiled a large dataset of nine species of callitrichines (n= 27,080 individuals; *Callithrix geoffroyi*, *Callithrix jacchus*, *Cebuella pygmaea*, *Saguinus imperator*, *Saguinus oedipus*,

Leontopithecus chrysomelas, *Leontopithecus chrysopygus*, *Leontopithecus rosalia*, and *Callimico goeldii*) from zoo and laboratory populations spanning 80 years (1938–2018). Through this comparative approach, we found several lines of evidence that litter size and sex composition may impact fitness. Singletons have higher survivorship than litter-born peers and they significantly outperform litter-born individuals on two measures of reproductive performance. Further, for some species, individuals born in a mixed-sex litter outperform isosexually-born individuals (i.e., those born in all-male or all-female litters), suggesting that same-sex competition may limit reproductive performance. We also document several interesting demographic trends. All but one species (*C. pygmaea*) has a male-biased birth sex ratio with higher survivorship from birth to sexual maturity among females (although this was significant in only two species). Isosexual litters occurred at the expected frequency (with one exception: *C. pygmaea*), unlike other animals, where isosexual litters are typically overrepresented. Taken together, our results indicate a modest negative effect of same-age sibling competition on reproductive output in captive callitrichines. This study also serves to illustrate the value of zoo and laboratory records for biological inquiry.

✓ Facial width-to-height ratio is associated with agonistic and affiliative dominance in bonobos (*Pan paniscus*)

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Abstract: Facial width-to-height ratio (fWHR) is associated with social dominance in human and non-human primates, which may reflect the effects of testosterone on facial morphology and behaviour. Given that testosterone facilitates status-seeking motivation, the association between fWHR and behaviour should be contingent on the relative costs and benefits of particular dominance strategies across species and socioecological contexts. We tested this hypothesis in bonobos (*Pan paniscus*), who exhibit female dominance and rely on both affiliation and aggression to achieve status. We measured fWHR from facial photographs, affiliative dominance with Assertiveness personality scores and agonistic dominance with behavioural data. Consistent with our hypothesis, agonistic and affiliative dominance predicted fWHR in both sexes independent of age and body weight, supporting the role of status-seeking motivation in producing the link between fWHR and socioecologically relevant dominance behaviour across primates.

- ✓ Contrasting climate risks predicted by dynamic vegetation and ecological niche-based models applied to tree species in the Brazilian Atlantic Forest

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(2019) *Regional Environmental Change*: 19: 1 : pp. 219 - 232.

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Abstract: Climate change is a threat to natural ecosystems. To evaluate this threat and, where possible, respond, it is useful to understand the potential impacts climate change could have on species' distributions, phenology, and productivity. Here, we compare future-scenario outcomes between a dynamic vegetation model (DVM; CARbon Assimilation In the Biosphere (CARAIB)) and an ecological niche-based model (ENM; maximum entropy model) to outline the risks to tree species in the Brazilian Atlantic Forest, comprising the habitats of several endemic species, including the endangered primate *Leontopithecus chrysomelas* (golden-headed lion tamarin; GHLT), our species of interest. Compared to MaxENT, the DVM predicts larger present-day species ranges. Conversely, MaxENT ranges are closer to sampled distributions of the realised niches. MaxENT results for two future scenarios in four general circulation models suggest that up to 75% of the species risk losing more than half of their original distribution. CARAIB simulations are more optimistic in scenarios with and without accounting for potential plant-physiological effects of increased CO₂, with less than 10% of the species losing more than 50% of their range. Potential gains in distribution outside the original area do not necessarily diminish risks to species, as the potential new zones may not be easy to colonise. It will also depend on the tree species' dispersal ability. So far, within the current range of *L. chrysomelas*, CARAIB continues to predict persistence of most resource trees, while MaxENT predicts the loss of up to 19 species out of the 59 simulated. This research highlights the importance of choosing the appropriate modelling approach and interpretation of results to understand key processes.

- ✓ Bonobo personality predicts friendship

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Abstract: In bonobos, strong bonds have been documented between unrelated females and between mothers and their adult sons, which can have important fitness benefits. Often age, sex or kinship similarity have been used to explain social bond strength variation. Recent

studies in other species also stress the importance of personality, but this relationship remains to be investigated in bonobos. We used behavioral observations on 39 adult and adolescent bonobos housed in 5 European zoos to study the role of personality similarity in dyadic relationship quality. Dimension reduction analyses on individual and dyadic behavioral scores revealed multidimensional personality (Sociability, Openness, Boldness, Activity) and relationship quality components (value, compatibility). We show that, aside from relatedness and sex combination of the dyad, relationship quality is also associated with personality similarity of both partners. While similarity in Sociability resulted in higher relationship values, lower relationship compatibility was found between bonobos with similar Activity scores. The results of this study expand our understanding of the mechanisms underlying social bond formation in anthropoid apes. In addition, we suggest that future studies in closely related species like chimpanzees should implement identical methods for assessing bond strength to shed further light on the evolution of this phenomenon.

Attended meetings

FAUNA DAY

“STUDY AND CONSERVATION OF WILDLIFE IN TROPICAL AND TEMPERED ENVIRONMENTS”

Faculty of Gembloux Agro-Bio Tech (ULiège) – NOVEMBER 4, 2019



Eva GAZAGNE, *ULiège*



Gwennan GIRAUD, *ULiège*



Jacob WILLIE, *KMDA*

Oral presentations by:

- **Eva GAZAGNE** (ULiège): “Habituation process of a social primate in a degraded forest fragment”
- **Gwennan GIRAUD** (ULiège): “Using social network analysis to assess socio-behavioural differences in female macaques following sterilization”
- **Jacob WILLIE** (KMDA): “Defaunation and habitat use in small mammals: preliminary data from south-east Cameroon”
- **Manon VERBEKE** (ULiège/GxABT): “Comparative analysis of hunting practices and the state of animal communities in two hunting areas in Gabon”

News from abroad

XXXIIND CONFERENCE OF THE FRENCH-SPEAKING PRIMATOLOGICAL SOCIETY (SFDP) Branféré, October 2-5, 2019

The 35-hectare Zoo and Botanical Garden of Branféré is located in Le Guerno, Morbihan, Brittany, France. Visitors can see the animals roaming freely in a centuries-old botanical garden.

From 1662 until 1988, the garden was a private estate, with a castle built in 1848 by the family of Freslon Freslonnière. It was acquired in 1884 by Casimir Jourde, whose grandson Paul became a wildlife painter and world traveller. In the 1930s, Paul and his wife, Hélène Castori, having discovered a game reserve maintained by Khengarji III, Maharao of Kutch, decided to create an “animal paradise” at Branféré by letting exotic animals from around the world acclimatize to the property and roam free, creating a park where animals and humans could interact. In 1965, the park opened to the public after thirty years of development and, in 1988, it was bequeathed to the Fondation de France.

The Fondation de France, in collaboration with the Fondation Nicolas Hulot pour la Nature et l’Homme and the commune of Muzillac, have created the Nicolas Hulot School for Nature and Man, open since 2004 at Park Branféré.



Vinciane FACK (*ULB*),
winner of the 2019 Doctoral Prize (€ 800) awarded by the SFDP

More information about SFDP prizes and grants:
<http://sfdp-primatologie.fr/index.php?page=les-prix>

Here follow the Belgian contributions at the XXXIInd SFDP congress.

- ✓ Geophagy in yellow-tailed woolly monkeys (*Lagothrix flavicauda*), a Critically Endangered primate species endemic to Peru (« La géophagie chez le singe laineux à queue jaune (*Lagothrix flavicauda*), espèce endémique du Pérou et en danger Critique d'Extinction »)
Vinciane FACK¹, Régine VERCAUTEREN DRUBBEL¹, Sam SHANEE², Martine VERCAUTEREN¹, Hélène MEUNIER³
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The intentional ingestion of soil is documented throughout the animal kingdom and is described as a behaviour improving mineral supplementation, digestion, detoxification of secondary metabolites or self-medication. Geophagy was recently observed in a free-ranging group of yellow-tailed woolly monkeys (*Lagothrix flavicauda*) – a critically endangered, large-bodied, little studied neotropical primate species endemic to the cloud mountain forests in the northeastern Peru. It represents a flagship species for the conservation of the Tropical Andes. We aimed to highlight how individuals perform geophagy, the effect of seasonality and age/sex classes on its expression, to characterize the physical aspect of geophagy sites and to analyze the composition of soils consumed and controls. Data were collected during a 14 months' field survey between 2016 and 2018, on a habituated group of 24 individuals. Geophagy events were recorded through camera traps located at previously known geophagy sites and through direct observations during behavioural focal animal follows. Soil samples were analyzed at the Universidad Nacional La Molinain Lima, in terms of texture, pH, minerals and iron contents, following the methods of the laboratory (i.e., hydrometer and potentiometer were used, Walkley and Black method, flame photometry and extraction method with Hunter solution). We counted 68 geophagy events –all were brief with a mean of 15 seconds and occurred significantly mostly in dry seasons. All age/sex classes performed geophagy but females spent more time eating soil than males. Adults used predominantly their hands to retrieve soil while juveniles used their mouth. Sites used were small and on slope. Soils consumed were red, soft, bare and were richer in clay and poorer in minerals than controls. Our results suggest that geophagy in *L. flavicauda* is a crucial behaviour, given that these arboreal animals descend to the ground, which is rare, if not absent of their habits, and represents a severe risk in an area of high human population density. This behaviour and its implication need to be considered in conservation plans of the species. Indeed, geophagy sites can be recognized following certain visual cues, so it would be important to inventory them, to promote them in local communities living around for protecting them from deforestation.



Eva GAZAGNE (ULiège, KMUT)



Sylvie LETOT (Master Biology, ULiège)

- ✓ Northern pigtailed macaques rely on old growth plantations to offset low fruit availability in a degraded forest fragment in Thailand (« Faire face à une faible disponibilité en fruits dans un habitat dégradé : rôle des plantations chez les macaques à queue de cochon (*Macaca leonina*) en Thaïlande »)

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Space-use patterns and foraging strategies are crucial to understand the ecological resilience of primates in degraded habitats. However, detailed ranging data are scarce, especially for Southeast Asian primate species. Our study examined movement, ranging, and foraging patterns within a group of 141 ± 10 northern pigtailed macaques (*Macaca leonina*). We followed the macaques and recorded their diet and movements, in regards to fruit availability, within a degraded habitat with reclaimed plantation forest in the Sakaerat Biosphere Reserve, northerneastern Thailand. Using hidden Markov Models (HMMs) and Characteristic Hull Polygons (CHPs), we analyzed these patterns for 14 months in regard of fruit availability. We found that the macaques' home range of 599 ha covered two types of forest with asynchronous fruit availability, the dry-evergreen forest (DEF) and the plantation forest. During high fruit availability in DEF, macaques were more likely to forage actively in the interior native DEF. By contrast, during low fruit availability in DEF, macaques foraged less in a continuous way and repeatedly moved from a foraging behavior to a transiting one. They also extended their range to plantation forest and edge areas, which resulted in significantly larger monthly home range, core area, longer daily path length, lower site fidelity, as well as faster and more oriented movement. The concomitant macaques' diet shifted from fleshy to dry fruits such as exotic Acacia species. Our results show that northern pigtailed macaques adapt their movement dynamic, ranging pattern and diet according to fruit availability. They respond primarily to the availability of native fruits, then travel directly toward plantation forest or edge areas with predictable food resources when fruit are scarce. These patterns reflect both energy-maximizing and energy-minimizing strategies and suggest a way used by macaques to cope with habitat degradation. Our study combining ranging pattern analyses with HMMs provides a new and complete picture of movement, ranging and foraging patterns in macaques living in a degraded forest fragment. It contributes to deepen knowledge about

the ecology and factors affecting the ranging patterns and resource use of this poorly-known and vulnerable species, a preliminary step to design appropriate conservation strategies.

- ✓ Personality and stress management in the common marmoset (*Callithrix jacchus*)
Sylvie LETOT^a, Maxence DECELLIERES^A, François DRUELLE^B, Pablo Molina VILA^A
^a *Station de Primatologie (UPS 846) – CNRS, Rousset-sur-Arc, France*
^b *Histoire Naturelle de l'Homme Préhistorique (UMR 7194), Muséum National d'Histoire Naturelle, Paris, France*
Abstract in English: not available.



Fany BROTCORNE (ULiège)



Régine VERCAUTEREN DRUBBEL
(ULB, SFDP representative at IPS)

- ✓ Role of reproductive status in social network of female long-tailed macaques (*Macaca fascicularis*) (« Rôle du statut reproducteur dans le réseau social des femelles chez le macaque à longue queue (*Macaca fascicularis*) »)
Gwennan GIRAUD¹, Marine LARRIVAZ², I. Nengah WANDIA³, Pascal PONCIN¹, Fany BROTCORNE⁴
¹ *Research Unit FOCUS, University of Liège, Belgium*
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⁴ *Research Unit SPHERES, University of Liège, Belgium*

In cercopithecine primate societies, offspring play a key role in female social relationships. Adult female macaques are very attracted to non-weaned infants and tend to groom more frequently mothers bearing them than non-lactating females, as a strategy which may eventually promote the likelihood of alloparental care and infant handling while sealing strong alliances between involved females. Even though infants are expected to play a role in creating and maintaining the social bonds between adult females, this question has rarely been investigated at the group-level. Our study investigated the direct influence of non-weaned infants on the social position of the females within their social network, and the role that infants play in the social cohesion of a group of wild long-tailed macaques (*Macaca fascicularis*) living in the protected area of Sangeh in Bali, Indonesia. Using social network analysis, we studied the effect of the reproductive status on the behaviour, the individual centrality measures and the group cohesion metrics by comparing lactating with non-lactating females, while controlling for the effect of their dominance rank. We collected 190 hours of

focal and scan sampling observation on the 19 (sub)adult females of the group (*i.e.*, 10 hours per individual) over 3 months from March to May 2019. During focal sampling, we recorded duration of behaviours including affiliative, agonistic and infant (allo)caring interactions. We used proximity scan to record the frequency of spatial proximities (*i.e.*, inter-individual distances: contact, <1 m, <3 m, <5 m). We then generated activity budgets and social matrices specific to several affiliative networks (*e.g.*, allogrooming and spatial proximity). Results regarding the activity budget show that lactating females spent more time in global affiliative behaviours with any partner, less time in self-directed behaviours and less time resting than non-lactating females. We then run linear models on centrality and connectivity metrics which confirmed these behavioural differences at the female network-level. Lactating females received more grooming and were connected to a higher number of female partners than non-lactating females. The former were then more central and played an important role in the group cohesion. Conversely, dominance rank had no influence on affiliative networks. These results highlight the influence of the reproductive status on the social dynamics within a female macaque social network, and consequently the essential role played by non-weaned infants as social bonding vector in these affiliative networks.

Monkey bridge at Branféré



Hélène MEUNIER, *UStrasbourg*
Fany BROTCORNE, *ULiège*
Régine VERCAUTEREN DRUBBEL, *ULB*



Jean-Pierre GAUTIER
Dir.-Hon. CNRS, Univ. Rennes

Here follows the public lecture.

✓ The many facets of primatology

Bertrand DEPUTTE

Professor Deputte was one of the founding members of the SFDP in 1987. He was Research Director at the National Center for Scientific Research and Professor of Ethology at the Veterinary School of Maisons-Alfort.

He is a member of the French Veterinary Academy. His research work in ethology is internationally recognized.

“Primatology is not a scientific discipline. It is named after the subjects of study, such as ornithology, mammology, herpetology or parasitology for example. Primatology therefore comes from various disciplines of biology. The specificity of the Francophone Primatology Society is the desire to bring all these disciplines together in the coherence of the converging interest of researchers for a global knowledge of an order to which we humans belong.”



Bertrand DEPUTTE

*Member French Veterinary Academy,
Founding member of the SFDP & EFP*

Régine VERCAUTEREN DRUBBEL

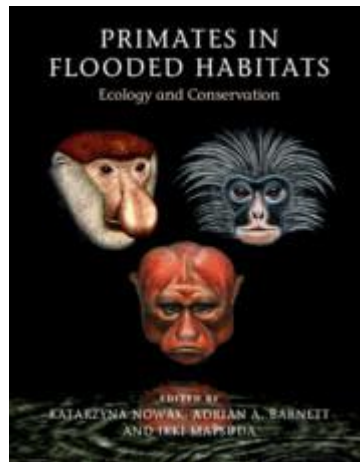
*ULB,
Founding member of the EFP*

Meetings Calendar

- ✓ **IVTH EUROPEAN CONFERENCE ON TROPICAL ECOLOGY**
Date: March 24-27, 2020. Location: Campus Augustusplatz / Leipzig University.
Theme: The future of tropical ecosystems – new insights and innovative methods.
Deadline for abstract submission and early registration January 16, 2020.
- ✓ **PRIMATOLOGICAL SOCIETY OF GREAT BRITAIN (PSGB) SPRING MEETING**
Date: April 23-24, 2020. Location: Liverpool John Moores University, UK. Theme:
Latest Advances in Primatology.
- ✓ **XXVIIITH CONGRESS OF THE INTERNATIONAL PRIMATOLOGICAL SOCIETY (IPS)**
Date: August 16-21, 2020. Location: Quito, Ecuador. Organizer: Universidad San Francisco de Quito (USFQ). Theme: Integrating hemispheres: primate research and conservation from the middle of the world. Deadline by January 16, 2020 for early bird registration and submitting abstract(s) for individual presentations (talks in symposia, talks in free paper sessions, and posters). At least renew your IPS membership and register for the Joint Meeting between January 1 and January 10, 2020. This should allow you to submit your abstract(s) by January 16, with few, if any problems. Website: <https://ipsquito.com>.



New Book



PRIMATES IN FLOODED HABITATS – ECOLOGY AND CONSERVATION

Cambridge University Press, 2019, edited by

Katarzyna NOWAK, University of the Free State, South Africa

Adrian A. BARNETT, National Institute for Amazon Research, Brazil

Ikki MATSUDA, Chubu University/Kyoto University/Japan Monkey Centre, Japan

Nearly half the world's primate species use flooded habitats at one time or another, from swamp-going Congo gorillas and mangrove-eating proboscis monkeys, to uacaris in Amazonian riverside forests. This first-ever volume on the subject brings together experts from around the world in a ground breaking volume spanning fossil history, current biology and future research and conservation priorities. Flooded habitats are a vital part of tropical biology, both for the diversity of the species they house, and the complexity of their ecological interactions, but are often completely overlooked. This book will set the stage for a new wave of research on primates in these extraordinarily productive and highly threatened areas, and is ideal for researchers and graduate students in primatology, zoology, ecology, and conservation.

The range of flooded habitats across the tropics has undoubtedly influenced the evolution and persistence of non-human primates. The diversity of wetland habitats is mirrored by highly biodiverse inhabitants, including primates which may use flooded areas for refuge given these are not easily accessible to humans. When surrounding terra firma forest has been cleared, often much of the original floodplain forest remains standing because wet areas are not as ideal for agriculture and habitation. As a consequence, despite large-scale land-use change and habitat degradation, flooded habitats still host a large number of primates and other mammals that may otherwise be rare or even extinct.

Table of Contents

Part I. Introduction; Part II. Primates of Mangrove and Coastal Forests; Part III. Beach Primates; Part IV. Swamp Primates; Part V. Primates from Freshwater Flooded Forests; Part VI. Conservation Case Studies; Part VII. Conservation, Threats and Status

Primate Gossip



Best wishes for a
primatological
promising
2020!