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Belgian Group *for* Primatology

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For people with an interest in the study of primates

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Cover: Adult male Mandrill (*Mandrillus sphinx*), Lékédi Park, Bakoumba, Gabon
© Gontran NSI AKOUE (PhD, USTM, Franceville)

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BELGIAN GROUP for PRIMATOLOGY

Editorial

Dear BGP members,

Here is your new issue of "Primate Tidings", filled with interesting abstracts, news, and more!

Régine will talk in her "Corner" about the main attractions of this issue, but, as I have always been interested in relations between humans and their (animal) environment, I would like to mention a very interesting new book by ***Vincent LEBLAN*** *entitled "Aux frontières du singe", which outlines the relationships between humans and chimpanzees in Kakandé, Guinea (Édition EHESS En temps et lieux, 2017).*

Have a pleasant reading of this issue of your "Primate Tidings"!

FRÉDÉRIC CLEENEWERCK DE CRAYENCOUR

President's Corner

Thanks to **Fany BROTCORNE** (ULg), the joint meeting of the BGP and FNRS contact group "Primatology" was successfully held at the University of Liège in June 2017. I am grateful to **Jean-Luc HORNICK** (ULg, VIT) and **Stefan DELEUZE** (ULg), who offered to host the meeting in the Faculty of Veterinary Medicine.
The invited veterinarians **Romain LACOSTE** and **Goulven RIGAUX** came from France and shed light on primate reproduction and conservation.
Several students and researchers presented their ongoing work competently and with enthusiasm.

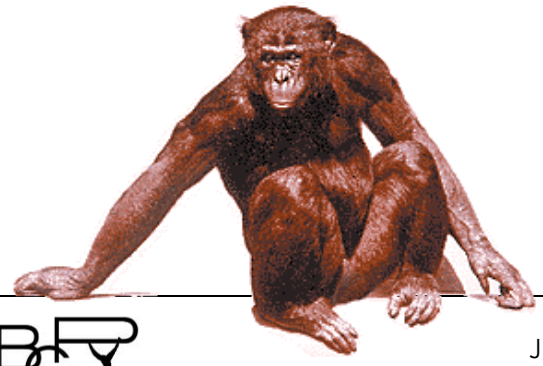
In February 2017, the European Conference of Tropical Ecology was held in Brussels. **Fany BROTCORNE**, **Marie-Claude HUYNEN** and **Roseline BEUDELS** chaired a session entitled "Is primate and other large vertebrate conservation still relevant in this rapidly changing world?" Several primatologists from Belgian Universities or Institutions gave their contributions with passion and accuracy.

In March 2017 in Franceville, I was one of the jury members of the PhD thesis of **Gontran NSI AKOUE**, who revealed the feeding on 140 vegetal species by free ranging mandrills in the Lékédi Park, Gabon. Among these, he observed the unexpected consumption of numerous bioactive species, used by local traditional healers.

From August 22 to August 25, 2017, the next conference of the European Federation for Primatology (EFP) will take place in Strasbourg, France. There are already more than 200 inscriptions. You can still join !
The Francophone Society of Primatology will celebrate its 30th anniversary on Monday August 21.

In 2018, the congress of the International Primatological Society is scheduled in Nairobi (Kenya) from August 19 to August 25, and the IPS 2020 in Quito (Ecuador) from August 16 to August 22.
The last IPS congresses in Africa were held in Madagascar (1998) and Uganda (2006). The next IPS congress hails a return to Kenya after 34 years!

REGINE VERCAUTEREN DRUBBEL



Meeting of the Belgian Group for Primatology

A joint meeting of the BGP and the FNRS contact group "Primatology" was organized on June 26, 2017. Our invited guests were both coming from France. **Romain LACOSTE** (Station de Primatologie Rousset, CNRS) focused on the reproduction working group he cofounded and the evaluation of contraceptive implant in male baboons. **Goulven RIGAUX** (Maubeuge Zoo) threw light on the paradox between conservation and contraception. The meeting was a success thanks to **Fany BROTCORNE** (ULg), **Jean Luc HORNICK** (ULg), the Tropical Veterinary Institute (IVT) and **Stéphane DELEUZE** (ULg) who kindly hosted the meeting in the Faculty of Veterinary Medicine at the University of Liège.

The program was as follows:

- Welcome message: **Marie-Claude HUYNEN** (ULg)
- Sterilization programme at Ubud Monkey Forest, Bali: prospects and trapping habituation process: **Fany BROTCORNE** (ULg), **Humphrey NELISSEN**, **Marie-Claude HUYNEN**
- Illegal meat trade: a threat to both biodiversity and public health: **Véronique RENAULT** (ULg), **Anne-Lise CHABER**, **Harriet GREEN**
- NON BREEDING SPECIES: THE PARADOX OF EX SITU CONSERVATION, AN EXAMPLE WITH THE CONTRACEPTION OF THE EASTERN BLACK-AND-WHITE COLOBUS (*Colobus guereza*): **Goulven RIGAUX** (Maubeuge Zoo, France) and **Stefan DELEUZE** (ULg)
- Feeding ecology of proboscis monkeys: nutritional and phytochemical aspects: **Valentine THIRY** *(ULB)*, **Charles S. VAIRAPPAN**, **Roseline C. BEUDELS-JAMAR**, **Régine VERCAUTEREN DRUBBEL**, **Senthilvel K. S. S. NATHAN**, **Benoît GOOSSENS**, **Martine VERCAUTEREN**
- Chimpanzee habituation process and conservation in Loango Reserve, Gabon: **Gwennan GIRAUD** (ULg)
- Assessing proboscis monkeys (*Nasalis larvatus*) role in seed dispersal and identifying animal interactions with *Nauclea orientalis* along the Kinabatangan River, Sabah (Malaysia): **Oriana BHASIN** (ULB),**Valentine THIRY**, **Danica J. STARK**, **Senthilvel K. S. S. NATHAN**, **Régine VERCAUTEREN DRUBBEL**, **Benoît GOOSSENS**, **Martine VERCAUTEREN**
- NON HUMAN PRIMATE REPRODUCTION WORKING GROUP AND ASSESSMENT OF CONTRACEPTIVE IMPLANT IN MALE BABOONS: **Romain LACOSTE** (Station de Primatologie Rousset, CNRS, France), **Pau MOLINA VILA**, **Slaveia GARBIT**, **Marie DUMASY**, **François DRUELLE**, **Guillaume MARTINEZ**
- Is the baboon model appropriate for endometriosis studies?: **Roland POLET** (UCL) and **Jean-Paul DEHOUX**
- Study of bird egg predation by northern pigtailed macaques (*Macaca leonina*) in Sakaerat Biosphere Reserve (Thailand) using artificial nests: **Olivier KAISIN** (ULg), **Eva GAZAGNE**, **Fany BROTCORNE**, **Tommaso SAVINI**
- Report on the 2016 Congress of the International Primatological Society (IPS) in Chicago, USA; announcement of the 2017 Congress of the European Federation for Primatology (EFP) in Strasbourg: **Régine VERCAUTEREN DRUBBEL** (ULB)
- Closing message: **Fany BROTCORNE** (ULg)



Romain LACOSTE (Rousset,FR) Goulven RIGAUD (Maubeuge,FR) Stefan DELEUZE (ULg)

Here follow the abstracts of the scientific communications:

- ✓ Assessing proboscis monkeys (*Nasalis Larvatus*) role in seed dispersal and identifying animal interactions with *Nauclea orientalis* along the Kinabatangan River, Sabah (Malaysia)

Oriana BHASIN [1] [*], ***Valentine THIRY*** [1], ***Danica J. STARK*** [2], ***Senthilvel K. S. S. NATHAN*** [3], ***Régine VERCAUTEREN DRUBBEL*** [1], ***Benoît GOOSSENS*** [2], ***Martine VERCAUTEREN*** [1]

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Efficient conservation planning requires understanding plant-animal interactions; endozoochory for instance plays an important role in forest regeneration. Since the 1980s, intensive forest clearing for oil palm plantations and logging in Borneo has severely impacted the endangered endemic proboscis monkeys (*Nasalis larvatus*). Being mainly folivorous, proboscis monkeys have never been considered as seed dispersers. However, in previous studies intact seeds were found in their faeces. This study therefore aims to assess their role in seed dispersal. It was conducted from November 2016 to April 2017 along the Kinabatangan River, in the Lower Kinabatangan Wildlife Sanctuary, Sabah**.** Preliminary results showed that approximately 60% of proboscis monkeys' faeces contained intact seeds; most of which were from the genus *Nauclea* (Thiry unpubl data), and that *Nauclea* seeds collected from faeces have a higher germination rate than seeds collected from fruits. Therefore, the focus of this study was the species *Nauclea orientalis*. Seed dispersal quantity (number of fruit species eaten, proportion of fruits in diet, number of faeces containing seeds, and number of seeds in faeces) and quality (seed viability and germination success) were examined. Other animal species feeding on *N. orientalis* fruits and potentially dispersing its seeds were also investigated. The research consisted of 57 sessions of boat-based behavioural observations of indiscriminate groups of *N. larvatus* (instantaneous scan sampling), faecal collection and germination tests as well as monitoring a river transect through boat-based surveys and camera trapping. Two Cercopithecidae, one Hominidae, one Sciuridae, one Pteropodidae, one Suidae and one Tragulidae species were recorded feeding on *N. orientalis* fruits. During this research, 88% of monkeys' faeces sampled contained intact seeds. Furthermore, intact *Nauclea* seeds were also found in the faeces of four Cercopithecidae, one Hylobatidae, one Hominidae and one Viverridae species. Further analyses are being performed to highlight these species' respective importance in *N. orientalis* seed dispersal. In conclusion, since effective conservation of *N. larvatus* requires reforesting critical habitats and linking forest fragments, this study is meant to provide useful information for conservation planning and reforestation program.

Fany BROTCORNE (ULg)
Marie-Claude HUYNEN (ULg)

Gwennan GIRAUD (ULg)

Olivier KAISIN (ULg)

- ✓ Sterilization program at Ubud Monkey Forest (Bali): prospects and trapping habituation process

F. BROTCORNE[1], H. NELISSEN[1], M-C. HUYNEN[1]
[1] Primatology Research Group, Behavioural Biology Unit, University of Liège

Over the past three decades, there has been a growing research interest for primates living in anthropogenic habitats and a flourishing debate around the best management practices. Indeed, the phenomenon is growing, widespread, with many species involved, in particular cercopithecines. In Asia, several macaque species proliferate in association with humans, which may lead to local overpopulation and growing conflict. Management strategies most often go from culling to translocation. Recently, primate birth control programs emerged as an ethical alternative to control overpopulation in the wild using sterilization or contraception. However, this approach still requires empirical data to evaluate sustainability and potential side effects. In Ubud Monkey Forest, a tourist sanctuary in central Bali (Indonesia), a female sterilization program will be implemented in the long-tailed macaque (*Macaca fascicularis*) population which has experienced a tenfold increase since the 1980s. Here, we present the prospects and methods of this program, arguing why we chose to target females using the permanent tubectomy solution, and developing the advantages of the endoscopic approach. A stage-structured matrix population model revealed that 54% of the adult females have to be sterilized over one reproductive year to stop the exponential growth. To solve the challenging issue of capture in free-ranging settings, we choose giant live-trapping cages in order to achieve a high number of captures while minimizing stress and discomfort for the macaques. Our preliminary results on the food baiting habituation process to the trapping cage revealed that, over the past four months, an increasing number of macaques have used the cage and we can expect capturing 11 adult females per trial. Finally, this holistic program encompasses long term demographic surveys and behavioural monitoring to control for efficiency and potential side effects.

- ✓ Illegal meat trade – a threat to both biodiversity and public health

*(presented by **Véronique RENAULT** (ULg))*
Anne-Lise CHABER[1, 2, 3 *], Yves LIGNEREUX[4], Sarah TEMMAN[5], Christelle DESNUES[5], Andrew CUNNIGHAM[3]
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Concerns have been raised about the illegal import of bushmeat from Africa into Europe. We highlight that illegal bushmeat traffic is an important threat to biodiversity conservation with CITES species not only being imported for personal consumption but also as part of a lucrative organized trade. Seemingly, this trade is also posing health risks to people and livestock that have not been thoroughly assessed yet. After estimating the scale of this international trade, finding around five tons of bushmeat per week smuggled in personal baggage through Paris Roissy-Charles de Gaulle airport, we sampled 18 illegal African bushmeat consignments and tested them for the presence of bacteria. Additionally, five smuggled smoked fish were analysed for polycyclic aromatic hydrocarbons, which are known carcinogens. All bushmeat samples had viable counts of aerobic bacteria above levels considered safe for human consumption. We also identified zoonotic bacterial pathogens in bushmeat and unsafe levels of carcinogens in fish. In addition, African simian bushmeat seized by French customs at Toulouse-Blagnac airport were screened for viral pathogens. Epifluorescence microscopy revealed the presence of virus-like particles in the samples. The illegal importation of meat is a potential risk for the introduction of pathogens into Europe.

- ✓ Habituation of chimpanzees at Loango National Park (Gabon)

Gwennan GIRAUD
Primatology Research Group, Behavioural Biology Unit, University of Liège

Primate habituation work is an important preliminary step to field research and requires several precautions to respect (wearing masks, remaining as neutral as possible…). The chimpanzees (*Pan troglodytes troglodytes*) of Loango National Park (Gabon) have been the subject of a great ape habituation project conducted by the Max Plank Institute since 2005, in collaboration with the ANPN. Recently (2014) this project split in two habituation programs between gorillas and chimpanzees. The interest of this study site is truly particular given the huge variety of habitats and the very large area of the home range used by the studied population of chimpanzees. After a brief description of the species and the study site, I will present here the different types of preliminary data which are collected to evaluate the progress of the habituation work. I will also briefly describe some specific behaviors which have been identified at this study site, such as stick tool use on Binga Binga Honeybee nests. This is the beginning of very fruitful future research projects.

- ✓ Study of bird egg predation by northern pigtailed macaques (*Macaca leonina)* in Sakaerat Biosphere Reserve (Thailand) using artificial nests

Olivier KAISIN [1, 2], ***Eva GAZAGNE*** [1, 2], ***Fany BROTCORNE*** [1], ***Tommaso SAVINI*** [2], ***Marie-Claude HUYNEN*** [1]
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[2] *Conservation Ecology Group, King Mongkut's University of Technology Thonburi*

Bird nest predation is frequent and widespread in non-human primates. Yet, very few studies focus on this specific feeding behaviour. Although nest predation is often describes as an opportunistic behaviour, little is known on foraging strategies and nest detection in primates. Being the prevalent cause of nest failure, nest predation influences both the population and

behavioural ecology of tropical birds which select specific nest sites and types to reduce detectability and accessibility by predators. Therefore, identifying the nests targeted by the northern pigtailed macaques will help shine light on their foraging strategies. In the degraded and fragmented environment of the Sakaerat Biosphere Reserve, nest predation is high, representing 65% of losses (Khachma, unpublished data). Snakes are the main predators (33%) while macaques are just behind, accounting for 25% of predation events. Such high predation rates by macaques raise the question as to if this feeding behaviour is opportunistic or selective. To determine the nature of this feeding behaviour, we studied the influence of nest type (open-cup or cavity), microhabitat (ex. understory density and canopy cover), density of nests (i.e., number of nests present within a 100 m radius of a given nest) and the density of predated nests (i.e., number of nests predated within a 100 m radius of a given nest) on nest predation by macaques, using artificial nests. Our results indicate that predation rates decreased with nest height but increased with the number of predated nests, which suggests that, when foraging for eggs, macaques are effective and plunder all the nests set up in the area. The density of nests, nest type and microhabitat had no effect on predation by macaques. Nest detectability and accessibility did not seem to affect predation by macaques. Therefore, we conclude that nest predation by macaques can be considered as a selective feeding behaviour, with macaques actively searching for this type of rich nutritional food.

- ✓ Non human primate reproduction working group and assessment of contraceptive implant in male baboons

***Romain LACOSTE*[1], *Pau MOLINA VILA*[1], *Slaveia GARBIT*[1], *Marie DUMASY*[1], *François DRUELLE*[2], *Guillaume MARTINEZ*[3]**

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According to IUCN, 50 % of primate species are endangered. Two different approaches exist to counter this biodiversity loss trend: in situ action to protect the habitat and ex-situ actions by hosting captive individuals mainly in zoological institutions. The main objective of the reproduction working group linked to the SFDP (Francophone Primatological Society) is to gather information on primate reproduction with a multidisciplinary approach between zoological parks and research laboratories. Members of the working group are ethologists, endocrinologists, veterinarians, physicians, semen specialists etc. Three main topics are covered by the group activities: (1) Gametes cryopreservation, (2) Endocrinology and reproduction behavior, and (3) Assisted Reproduction Techniques. Some studies have been done on semen extender selection for cryopreservation. A collaborative work was set up consisting on collecting primate testis from zoological parks since 2015. A mobile unit allowed members of the group to share their expertise in different site as zoological institutions.
Finally, a study on impact of desloreline implant on olive male baboons (*Papio anubis*) was done in 2015-2016. The behavior, spermatogenesis, testicular volume and salivary testosterone were recorded and analyzed. As expected, we observed a clear decrease in testicular volume and spermatogenesis and a not significant change in behavior (agonist and antagonist behaviors). However, salivary testosterone analyses were in accordance with biological parameters (spermatogenesis and testicular volume). Further investigations are needed to evaluate the efficacy of salivary hormonal follow-up.

- ✓ Is the baboon model appropriate for endometriosis studies?

***Roland POLET**, M.D.[1], **Jean-Paul DEHOUX**, D.V.M., Ph.D.[3], **Sylvie DEFRERE**, Ph.D.[1], **Jean SQUIFFLET**, M.D.[1], **Olivier DONNEZ**, M.D.[1], **Mélanie MESTDAGT**, Ph.D.[2], **Jean-Michel FOIDART**, M.D., Ph.D.[2], **Anne VAN LANGENDONCKT**, Ph.D.[1], **Jacques DONNEZ**, M.D., Ph.D.[1]*

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[3] Experimental Surgery Unit, Medical School, Institute of Experimental and Clinical Research, Université catholique de Louvain, Brussels, Belgium

Objective: To determine the prevalence of spontaneous endometriosis and the incidence of induced endometriosis after endocervical canal resection in baboons.
Design: Induction and follow-up of endometriosis in baboons, which is one of the primate species that develop spontaneous endometriosis. Forty-one baboons were checked for the presence of spontaneous endometriosis.
We then attempted to induce endometriosis in 30 of them by endocervical canal resection.
Setting: Institute of Primate Research, Nairobi, Kenya, and Catholic University of Louvain, Brussels, Belgium.
Animal(s): Forty-one baboons were checked for spontaneous endometriosis and 30 of them were used to develop a model of induced endometriosis.
Intervention(s): A total of 41 baboons underwent diagnostic laparoscopy for 10months. In a first step, 30 of this number subsequently underwent endocervical canal resection. In a second step, 20 of the 30 underwent uterine horn resection.
Main Outcome Measure(s): Follow-up by laparoscopy.
Result(s): Two of the 41 baboons were diagnosed with spontaneous endometriosis (4.8%). Twelve months after the surgical procedure to induce endometriosis, 8 of 29 animals presented with endometriotic lesions diagnosed by using laparoscopy and confirmed by histologic examination. The incidence of induced endometriosis in our model was thus 27.6%. In 2 baboons, endometriosis disappeared over time, resulting in a final rate of 20.7% (6/29).
Conclusion(s): The rate of spontaneous endometriosis is very low (4.8%). Endometriosis can be induced (with a rate of just 27.6%) by endocervical canal resection to stimulate retrograde menstruation.

Oriana BHASIN (ULB)

Valentine THIRY (ULB)

R. VERCAUTEREN DRUBBEL (ULB)

- ✓ Feeding ecology of proboscis monkeys (*Nasalis larvatus*): nutritional and phytochemical aspects

Valentine THIRY[1,2*], Charles S. VAIRAPPAN[3], Roseline C. BEUDELS-JAMAR[2], Régine VERCAUTEREN DRUBBEL[1], Senthilvel K. S. S. NATHAN[4], Benoît GOOSSENS[4,5], Martine VERCAUTEREN[1]

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Food availability as well as food nutritional properties influence the diet selection in primates. Colobines are leaf-eating primates; they mostly feed on young leaves as well as unripe fruits and seeds and generally choose a diet with a high 'protein/fibre' ratio. Our research focusses on the nutritional content of proboscis monkeys' diet inhabiting the riverine forests of the Lower Kinabatangan Wildlife Sanctuary, in Sabah (Malaysian Borneo). This data is crucial to provide a better understanding of the feeding strategy and nutritional ecology of this endangered colobine species. Proximate analyses were carried out on 10 food species that together accounted for more than 80% of proboscis monkey feeding occurrences at riverside. Feeding data were collected during 13 months by boat-based behavioural observations. For each sampled species, young leaves were collected from several individuals located on the riverbanks and for five of these species we also sampled young leaves from several individuals located further than 350 meters inside the forest. Moreover, we sampled unripe fruits from *Nauclea orientalis* and *Ficus racemosa* at riverside. We observed that unripe fruits were richer in lipids but had a lower 'protein/fibre' ratio than young leaves. Young leaves sampled at the riverside had a higher 'protein/fibre' ratio than young leaves sampled further inland. Preferred food species – *Ficus racemosa* and *Octomeles sumatrana* – had a higher 'protein/fibre' ratio, more crude ash but less tannins than the eight other food species. Our study provides new insights on the feeding ecology of proboscis monkeys inhabiting secondary riverine forests. This knowledge is essential to ensure the conservation of this endangered primate species.



Roland POLET (UCL) … Jean Luc HORNICK (ULg) Nathalie SIMON (UPV)
Roseline BEUDELS (RBINS)

What's Going On from Belgian Side?

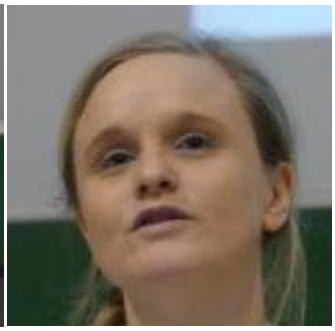
European Conference of Tropical Ecology
(Brussels, February 6-10, 2017)

(RE)CONNECTING BIODIVERSITY IN SPACE AND TIME

It highlighted both the importance of integrating fundamental sciences inferring past processes (e.g. paleoecology, evolution, social history…) to understand current patterns of biodiversity, and the urgent need to reconnect patches of fragmented landscapes if we wish to conserve tropical biodiversity and ecological services of tropical ecosystems for future generations.

Social event: 'Les Tambours du Burundi'





Roseline BEUDELS-JAMAR (RBINS), ***Marie-Claude HUYNEN*** (ULg), ***Fany BROTCORNE*** (ULg) chaired following session:

Many contributions from Belgian Universities and Institutions, of which following connected to Primatology:

- ✓ Metabarcoding: development of genetic tools for the study of the herbivore diet of *pan paniscus*

Arthur BOOM[1], ***Adeline SERCKX***[2, 3], ***Olivier HARDY***[1]
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In the context of an eco-ethological study taking interest of a bonobo community in the southern part of the lake Tumba landscape (DRC), the diet of these primates has been described through visual analysis of the content of bonobo faeces. This previous work allows us to test the possibilities offered by new technologies of sequencing (NGS) in the case of diet study. As described in other works treating of diet analysis using metabarcoding, we amplified by PCR the P6 loop of the trnL. This sequence amplified from bonobo faeces (n =196), is a short, variable DNA plastidial sequence. After sequencing through the use of an Illumina Miseq platform, the sequences were submitted to several bioinformatical filtering steps and then were confronted with two kinds of reference dataset: a global one based on sequences coming from EMBL and a local one, based on sequencing of the local flora. The results permitted the identification of nearly 130 consumed plant sequences. The metabarcoding approach, even if it allows a much higher detection threshold than visual technique, does not perform well in term of identification. Indeed, 74% of the sequences were assigned above the genus level. However, the results in this case can be improved with some work on the reference database.

- ✓ Reproduction control as a management strategy for local overpopulation of primates in tropical human-dominated habitats: a review

Fany BROTCORNE[1,2], ***I. Nengah WANDIA***[3], ***Pascal PONCIN***[1], ***Marie-Claude HUYNEN***[1]
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Today, anthropogenic pressures are posing major challenges to Asian primates, forced either to adapt ecologically and behaviourally to the human massive encroachment into natural habitats, or to disappear. Species ability to survive in human-modified habitats greatly varies, with generalist species, such as Cercopithecines, being more likely to thrive. Several macaque species in particular proliferate in situations of commensal association with humans, which leads sometimes to local overpopulation. High density of primates, resulting from the combined effect of population spatial compression and positive demographics, systematically induces conflicts with humans over crop-raiding and nuisance issues. Different management strategies have been deployed these last decades, going from culling or trapping programmes to sterilization campaigns. Sterilization is an ethical and flourishing solution to mitigate the human macaque conflict by limiting the population expansion, but very few empirical data are available about their efficiency and potential side effects. We propose here to review various macaque sterilization programmes conducted in Asia, highlighting the pros and cons as well as the short- and long-term effects. As a study case, we will present data on population dynamics and side behavioural effects, as the base for an ongoing sterilization programme in a population of long-tailed macaques (*M. fascicularis*) in Bali (Indonesia). This population has experienced a tenfold increase over the last 30 years. Vasectomy undergone by several males in a former approach was

not efficient to limit births. With others, we argue that macaque's reproductive profile requires female sterilization. The goal here is to stimulate discussion over management of forced coexistence scenarios between human and primates, since this phenomenon is an integrative part of conservation in this rapidly changing world.

- ✓ Assessment and conservation of genetic diversity in captive and wild primate populations

Peter GALBUSERA[1], ***Kristel DE VLEESCHOUWER***[1], ***Philippe HELSEN***[1], ***Kristin LEUS***[1,2], ***Elke VERMEULEN***[1], ***Carlos RUIZ-MIRANDA***[3], ***Becky RABOY***[4], ***Leo OLIVEIRA***[5], ***Jim DIETZ***[6], ***Andreia MORAES***[3], ***Adriana GRATIVOL***[3]

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The Golden-headed lion tamarin (Ghlt) is an endangered primate species, with a mandate from the Brazilian government for a genetically and demographically self-sustainable captive population with the primary role of population insurance. The secondary roles are conservation education, research and fundraising. Assuming Ghlt founders are unrelated, the world captive population is large enough (about 520 individuals) to ensure conservation of 90% of gene diversity (GD) of the wild population for 100 years.
The current GD of the world captive population is 98% and 96% in the European (EEP) population. However, when taking into account founder relatedness (as estimated by molecular markers), this EEP estimate is reduced to about 86%. Using the same genetic markers, we also assessed GD in wild populations. Overall, the results suggest that these populations have a relatively low GD and high population genetic structure, raising questions about the actual functional landscape connectivity.
Results suggest that captive animals may have originated from cross-breeding, resulting in relatively high GD compared to the wild. The continued loss of habitat makes it desirable to continue managing the self-sustainable world captive population as an insurance population. Future genetic research will further optimize this management in captive as well as wild populations.


Adeline SERCKX(ULg)


Barbara HAUREZ(Gembloux)


E. HEYMAN(Göttingen)


Nima RAGHUNATHAN(ULg)

- ✓ A look at intact forest landscapes and their relevance in Central African forest policy

Barbara HAUREZ[1, 2, 3]***, Kasso DAÏNOU***[1, 2, 4]***, Cédric VERMEULEN***[2, 3]***, Fritz KLEINSCHROTH***[5, 6]***, Frédéric MORTIER***[5]***, Sylvie GOURLET-FLEURY***[5]***, Jean-Louis DOUCET***[2, 3]

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Tropical forests are important providers of natural resources and ecosystem services but their ecological functions are facing increasing human pressure, linked to economic development. The preservation of tropical forest ecosystems is interrelated with effective land use planning and identification of priority areas for conservation.

Initially defined by Greenpeace and the World Resources Institute (WRI) in 2000, Intact Forest Landscapes (IFLs) are large areas of forest minimally impacted by human activities. IFLs were identified by mapping industrial activities, road networks and infrastructure using remote sensing.

Since 2014, when IFLs were recognized and adopted by the certification scheme Forest Stewardship Council (FSC), the IFLs have become integrated into forest management policies. In order to trace the history and evaluate the applicability of IFLs for forest management policy in the Central African context, we searched for documents related to the IFL method, and previous similar concepts.

The IFL method is simple and cost-effective and enables the monitoring of forest degradation at a global scale. However, the approach mainly considers forest cover and is imprecise at the local scale. For example, hunting, one of the main threats faced by Central African ecosystems, cannot be detected by satellite imagery and is therefore disregarded in IFL identification processes. In contrast, there are other considered anthropogenic activities, such as reduced-impact selective logging, which may be compatible with forest ecosystem conservation.

To better tailor the IFL approach to Central African forests, we recommend (i) the consideration of wildlife communities distribution in the analysis of disturbance, (ii) a thorough evaluation of the impacts of different human activities on forest ecosystems, and (iii) the integration of local stakeholders and governments in the design of land management strategies devised to address social, economic and environmental needs.

Chantal SHALUKOMA (ULB)

Nikki TAGG (CRC)

Leslie WILMET (Gembloux)

- ✓ Long-term consistency in spatial patterns of primate seed dispersal

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Seed dispersal is a key ecological process in tropical forests, with effects on various levels ranging from plant reproductive success to the carbon storage potential of tropical rainforests. On local and landscape scales, spatial patterns of seed dispersal create the template for the recruitment process and thus influence the population dynamics of plant species. The strength of this influence will depend on the long-term consistency of spatial patterns of seed dispersal.
We examined the long-term consistency of spatial patterns of seed dispersal with spatially explicit data on seed dispersal by two Neotropical primate species, *Leontocebus nigrifrons* and *Saguinus mystax* (Callitrichidae) collected during four independent studies between 1994 and 2013. Using distributions of dispersal probability over distances independent of plant species, cumulative dispersal distances and kernel density estimates, we show that spatial patterns of seed dispersal are highly consistent over time. For a specific plant species, the legume *Parkia panurensis*, the convergence of cumulative distributions at a distance of 300m, and the high probability of dispersal within 100m from source trees coincide with the dimension of the spatial-genetic structure on the embryo/juvenile and adult stage, respectively, of this plant species. Our results are the first demonstration of long-term consistency of spatial patterns of seed dispersal created by tropical frugivores. Such consistency may translate into idiosyncratic patterns of regeneration.

- ✓ Impact of changing land-use and conservation management on mammal functional diversity in southeast Cameroon

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Beyond the loss of biodiversity, human activities may also affect ecosystem functioning. Estimating the diversity of ecological roles that species play within an ecosystem (i.e. functional diversity) can give insights into the state of an ecosystem and is arguably a better measure than estimates of biodiversity. This paper reports on a study performed to examine if changing land-use and conservation management affects mammal functional diversity. The study comprised three surveys in three different study sites: Madjuh, unprotected, suffering from high hunting pressures and having been intensely logged in the past; La Belgique, officially unprotected, yet managed as a research site with medium logging and hunting intensities; and Ekom, with an official protection status and has never been logged and experienced low hunting levels. We measured habitat composition, human activity levels and wildlife abundance, and calculated four indices for functional diversity. We calculated functional β-diversity to compare functional diversity between study sites.
The results show that the three study sites differ in habitat composition, human activity and wildlife abundances, but not in terms of functional diversity. Madjuh showed the highest

abundance of young secondary forest, the highest overall human activity levels and the lowest wildlife abundances. La Belgique showed a higher abundance of young secondary forest, medium levels of overall human activity and medium levels of wildlife abundance. Ekom showed the highest abundance of old secondary forest, lowest overall human activity levels and the highest overall wildlife abundance. These results indicate that, even though human-induced threats have impacted upon habitat composition and wildlife abundance, they have not directly affected functional diversity. We therefore advocate that the ecosystem health remains fairly high in La Belgique, which may be a result of the active management offered by the research presence and associated conservation actions which has reduced hunting in the area. However, we warn that the higher human activity levels and lower wildlife abundances in the unprotected sites might indicate that functional diversity will be affected in the future if urgent conservation management measures are not taken.

- ✓ Importance of UNESCO man and biosphere reserves in the tropics

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The UNESCO's Man and the Biosphere Program (MAB), with 669 reserves in 120 countries, including 16 transboundary sites, is an Intergovernmental Scientific Program to establish a scientific basis to improve relationships between people and their environments.
Biosphere Reserves (BR) have three zones where scientists, NGOs, local communities work together: • the core is mainly for long-term conservation and research, • the buffer zone is for activities like environmental education, monitoring eco-tourism and research, • the transition zone allows sustainable activities (agriculture, settlements).
The concept of BRs is interesting to model sustainable development and to monitor ecosystem responses to global changes. Well-known as sensitive areas are the tropical forest of which several are already classified as BRs. Recognizing the importance of these ecosystems across the world, in 2009, a Memorandum of Cooperation representing, Brazil, Indonesia and DR Congo was signed to address mainly capacity building, however the agreements of the exchange of scientific information and joint trans-continental publications remained too limited. The MAB-NET project (for Man and Biosphere Reserves Network), financed by the Belgian Science Policy Office (BELSPO) aims at improving the intercontinental exchange of knowledge on the management of the BRs reserves. It addresses aspects like scientific research, data and information management, policy making, conservation, legal issues and public engagement. The project will with two missions on site evaluate and compare the management of the MAB reserves of the Amazonas in Brazil (near Manaus) and in the MAB reserve of Luki in D.R. Congo. In its assessment, the positioning and collaboration with site monitoring networks such as the GEO-BON (Group for Earth Observation-Biodiversity Observation networks) and ILTER (International Long Term Ecological Research) will be taken into account. Since 2004 the Royal Museum for Central Africa developed many interdisciplinary projects in the Luki reserve, together with the Botanic Garden Meise, the ERAIFT and the universities of Ghent and Liège/Gembloux. In this talk the MAB-NET project will be presented, demonstrating how it fits

in the new UNESCO MAB Strategy and Lima Action Plan (2016-2015) and how it will contribute to enhance conservation and sustainable development in tropical areas.

- ✓ Conservation in the face of climate change

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In the tropics, frugivorous primates often play a key role in seed dispersal. Loss of this function due to hunting can pose an additional risk to vegetation and forest composition already mishandled by habitat loss. In this research, after intensive collection of field data, we simulated the movement of an endangered primate species (*Leontopithecus chrysomelas)*, its seed dispersal service, and plant growth in a context of climate change to evaluate the regeneration of one tree genus (*Pourouma)* in the Brazilian Atlantic forest.
A Hidden Markov Model analysis suggests that fruit availability index and sleeping site availability are main factors that influence this primates' movement. The distribution and presence of key fruiting species (for e.g. *Artocarpus heterophyllus*) also influences the movement and thus the dispersal kernel. Inter-disciplinary approaches, that link climate change, animal behaviour, and interactions between plants and animals, are fundamental and could provide a scientific foundation for conservation efforts. For example, by assessing the levels of risk of large-seeded tree species thanks to modelling, assisted regeneration projects can be designed with multiple species in degraded areas.

- ✓ Conservation of *Gorilla beringei graueri* and of its habitat proves also relevant to traditional medicine in Kahuzi-Biega Region, DR Congo

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This work was carried out in the mountain region of Kahuzi-Biega National Park (KBNP) in eastern DR Congo. This Park was primarily created to protect Grauer's Gorilla, *Gorilla beringei graueri*, a subspecies being recently upgraded to Critically Endangered. The aim of the study was to analyze conservation management of plants most used by traditional healers and at the same time by gorillas as food or possibly self-medication. On the one hand, gorilla's diet was assessed through direct observations of four groups. On the other, we thoroughly interviewed 88 traditional healers recognized as specialists in Batwa, Havu, Bashi and Tembo ethnic groups living around KBNP. Data analysis was conducted through quantitative ethnobotany and numerical ecology approaches.
The use of medicinal plants by traditional healers compared to gorilla food choices show that 78% of plant species consumed by these primates are also used in traditional medicine, with a similarity of 80% regarding plant parts. The high proportion of overlap reflects a potential competition for these dual-use plants, which endangers plants, gorillas as well as local medicine. The results also show the need for a better understanding of self-medication practices by Grauer's Gorilla. These insights may foster measures emphasizing conservation of specific plant species of KBNP, which are valuable for both great apes and humans.

- ✓ Changing hunting pressures and wildlife responses and the effectiveness of secondary conservation actions in the Dja landscape, Cameroon

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Hunting for meat is likely to be one of the greatest threats to the survival of wild animal populations in the tropics. Mammals represent >80% of all bushmeat coming out of tropical forests, and in African rainforests, over half of all mammal species feature among hunters' game. The majority of investigations in recent decades have found that bushmeat hunting in African rainforests is unsustainable.
This study took place in the Dja Landscape, Cameroon, with the aims to assess temporal trends in bushmeat hunting dynamics: hunting pressure, methods of hunting and bushmeat offtake composition; to identify the drivers of bushmeat harvesting; and to assess the impact of conservation efforts and help refine conservation strategies of the Cameroonian association, APGS (of Antwerp Zoo CRC). Surveys were carried out in 4 study periods: November 2002-October 2003; March-June 2006, March-June 2009 and February-December 2016. We applied descriptive and multivariate analyses to the data.
We found gun use to dramatically increase over the years, and snare hunting to decrease. We found the frequency of primates in the offtake to increase, and rodents to decrease slightly. We found more hunters in later years, but with a lower per capital offtake. We found hunting to depend on the profession of the villager, his physical ability, his social obligations, ecological factors and economic incentive. As a result of this intensifying hunting we also found animal abundance in the forest to decrease, but species richness remained stable both in the bushmeat offtake and in the forest, even until present day, suggesting a certain stability of the ecosystem. We also found no great apes in the offtake since 2002. This may be due to the presence and sensitisation of CRC/APGS. However, external factors (cheap motorbikes, demand from the cities) tend to override conservation efforts. To halt wildlife population loss, conservation efforts must be holistic to address to root causes of hunting.

- ✓ Bornean primates and forest regeneration: highlight on the proboscis monkey (*Nasalis larvatus*)

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Among all tropical regions, South-East Asia experiences the highest deforestation rate and is therefore of major conservation concern. The deforestation rate in Borneo has nearly been twice as fast as in all other tropical humid forests of the world and the major cause is clearly the conversion of primary forest into oil palm plantations.

Primates are amongst the largest animals in tropical forests and they often play an important role in seed dispersal, particularly in terms of the volume of seeds they disperse. Thirteen primate species inhabit the Bornean rainforest, making this island the richest area in primate species in South-East Asia. Among them, only five are confirmed to be active seed dispersers. Belonging to the *Colobinae* subfamily, proboscis monkeys, *Nasalis larvatus*, are generally considered as seed predators. However, a previous study recorded the presence of intact seeds in more than a quarter of their faeces.
Here, we investigated the potential role proboscis monkeys play in seed dispersal and forest regeneration in the Lower Kinabatangan Wildlife Sanctuary, Sabah (Malaysian Borneo). The study was conducted from May to August 2015 and January to June 2016. We randomly observed proboscis monkey groups at their sleeping sites along the Kinabatangan River. In average, we collected 13 ± 7 faecal samples every month.
We analysed 113 fresh samples at the field research station and observed that 62.7 % of those contained intact seeds. Surprisingly, more than 98 % of these seeds belonged to a single species, *Nauclea orientalis*. We conducted seed germination trials using five different treatments: F1: seeds from faeces without faecal material (n=298); F2: seeds from faeces with faecal material (n=98); FR1: seeds from unripe fruits (n=68); FR2: seeds from ripe fruits without flesh (n=56); FR3: seeds from ripe fruits with flesh (n=40). At the end of the experiment (100 days), the seeds that have been passed through the digestive tract of proboscis monkeys showed a significantly higher germination rate than control seeds ($\chi 2=133.34$, df=1, $P<0.001$). To our knowledge, these results are the first evidence of the potential role of proboscis monkeys as seed dispersers. These findings are of paramount importance for the conservation of this endangered primate species as well as the restoration of its habitat.

- ✓ Zoochoric trees as recruitment foci in afrotropical forests

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The influence of animal-mediated seed dispersal on the spatial organization of plant communities has received increasing attention. Yet, the causal mechanisms leading to clumped dispersal patterns and recruitment foci remain poorly understood.
Here, we aimed at (i) comparing the influence of hornbills and primates in generating recruitment foci under zoochoric trees, and (ii) exploring the influence of fruit availability in the neighborhood, and the amount of forest cover in the landscape on such patterns.
We found that the density and species richness of hornbill-dispersed seedlings were higher under hornbill-dispersed trees than at control locations, and that an increasing amount of forest cover in the landscape tended to increase the density of hornbill dispersed seedlings. Although significant, those tendencies were weak and suggest non negligible influence of other processes in the composition of the seedling community.
We concluded that both local and landscape factors influence animal-mediated recruitment foci and that the bi-trophic system investigated plays a structuring role in Afrotropical forests. This finding has important consequences for our understanding of the causal mechanisms responsible for spatial patterns in tropical communities.

- ✓ Is there a future for *Lepilemur mittermeiri*, an endemic and threatened lemur species of the Ampasindava Peninsula, in Northwest Madagascar?

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Madagascar is one of the richest biodiversity hotspots on the planet but it is, also, one of the most heavily impacted countries in the world in terms of forest degradation and general habitat loss and destruction. Most of the endemic fauna, including the lemurs, are in need of urgent and effective conservation measures. Sportive lemurs, of the genus *Lepilemur*, are small nocturnal folivores, exclusively arboreal. They have small distribution ranges, fairly small populations and are particularly negatively affected by deforestation and habitat fragmentation. Our research focuses on a poorly-known taxon, *Lepilemur mittermeieri*, whose distribution range is restricted to the Ampasindava peninsula in northwest Madagascar. The species was described in 2006 on the basis of genetic material only. Since then, very little research has been conducted and the ecology of the species is still very little known. General information on this endangered species is urgently needed in order to identify robust conservation guidelines for the species and its forest habitat. As this lemur is fully forest dependent, the threat of extinction is particularly severe in view of the very small amount of forest left on the peninsula, and the upcoming mining project in the area.

In this talk, we will present the results from three years field work on the species and its habitat. We will concentrate in particular on habitat use, home range, feeding ecology and sleeping sites characteristics as well as on the effect of forest fragmentation on *Lepilemur mittermeieri*.

From left to right: Frank TROLLIET (ULg), Nima RAGHUNATHAN (ULg), Chantal SHALUKOMA (ULB), Leslie WILMET (Gembloux-ULg), Régine VERCAUTEREN DRUBBEL (ULB), Roseline BEUDELS (RBINS), Fany BROTCORNE (ULg)
Marie-Claude HUYNEN (ULg)

Institutions of local organizers

- **UNIVERSITÉ LIBRE DE BRUXELLES** (cf. http://www.ulb.ac.be/)

Since its foundation in 1834, the Université Libre de Bruxelles has been closely involved in the ongoing debate on critical thinking and freedom. Promoting free enquiry and independent reasoning, the University is firmly engaged in the defence of democratic and human values.
In the heart of Europe, the ULB is a multicultural university with one third of students and researchers from abroad. International relations are a daily reality just like the city of Brussels itself, one of the world's most cosmopolitan cities. With 26,000 students, the ULB has 13 faculties that cover all the disciplines, closely combining academic input and research. It offers almost 40 undergraduate programs and 235 graduate programs. It also partners 20 Doctoral schools, with almost 1,600 PhD in progress. The ULB is located on several campuses in Brussels: Solbosch, La Plaine, Erasme teaching hospital. Several research units working in the Tropics are part of the Department of Organism Biology. Their research includes genetics, ecology, biogeochemistry, behavioural ecology…

- **VRIJE UNIVERSITEIT BRUSSEL** (cf. http://www.vub.ac.be/)

The Vrije Universiteit Brussel is a dynamic and modern university with two parkland campuses in the Brussels Capital Region: the main campus in Etterbeek is home to seven faculties. In Jette you can find the medical campus and the University Hospital. The VUB is the only Flemish university that has incorporated the principle of "free inquiry" in its statutes.
Centrally situated in the capital of Europe, the university takes up its role as an ambassador for Flanders and Brussels, in a spirit of active pluralism and open mindedness. Quality education is offered to more than 9,000 students. Add to that the almost 4,500 students of our partner, the Erasmus Hogeschool Brussels; the 400 students at the English-speaking Vesalius College; the 5,000 students at the Centre for Adult Education that shares our campus, and the more than 150 research teams working on both our campuses, and you get one of the biggest centres of knowledge in the capital of Europe.
High quality education and research are central issues. The research teams are internationally recognised in many disciplines of fundamental and applied research.

- **GEMBLOUX AGRO-BIO TECH – UNIVERSITÉ DE LIÈGE**
  (cf. http://www.gembloux.ulg.ac.be/)

Integrated at the University of Liège since 2009, Gembloux Agro-Bio Tech is a faculty of human size, open to the world and whose quality of teaching and research has been internationally renowned for more than 150 years. Faculty at the forefront of the sustainable development, Gembloux Agro-Bio Tech trains bioengineers. Four distinct study programs allow the students to specialize in key areas of life sciences, including forest and natural area management.
In tropical regions, the University of Liège has established numerous collaborative agreements with research and training institutions as well as with the private sector. It has also created a permanent structure in the Democratic Republic of Congo, aiming at developing research, teaching, training and expertise projects in Central Africa.

- **BOTANIC GARDEN MEISE** (cf. http://www.botanicgarden.be/)

Older than Belgium, the earliest roots of Botanic Garden Meise can be traced to 1796. The Garden comprises 92 ha and includes a castle that dates back to the 12th century. The Garden has a large herbarium housing about 4 million specimens and containing the largest Rosa herbarium of the world and important historical collections from Brazil and Central Africa. It also has a botanical library holding over 200,000 volumes, comprising publications from the 15th century to modern day. The Garden holds a collection of about 18,000 different kinds of living plants, among which several are threatened, such as the Laurent cycad (*Encephalartos laurentianus*). The Garden also houses an internationally recognised seed bank including inter alia the seeds of numerous wild bean species.

Activities of our scientists to inventory and study plant, fungal and algal diversity span the globe; from Antarctica to the rainforests of Congo. The scientific work focuses on the correct and scientific identification of plant species. On a yearly basis, approximately 100,000 people explore the glasshouses and the gardens, to spread knowledge about plants and conservation.

- **ROYAL MUSEUM FOR CENTRAL AFRICA TERVUREN**
  (cf. http://www.africamuseum.be/)

The RMCA was established in 1897 and, as a multidisciplinary institution focusing on conservation, education and research. It holds the largest biodiversity collection anywhere in the world on Central Africa. Furthermore, the majority of the specimens originate from the relatively poorly studied megadiversity belt in the equatorial Africa.

RMCA is a leading multidisciplinary research institute and knowledge centre on the cultural and natural heritage in Africa, particularly in Central Africa. It develops interest and understanding for African heritage in the scientific communities and the public. The researchers carry out studies in the natural and urban environments, including historical-socio-economical aspects. Natural History manages about 10 million specimens of animals, 60,000 wood specimens, 16,000 minerals, 300,000 rocks and 21,500 fossils. The institution has about 1.2 km of archives of unique interest like the Stanley collection, 200,000 cultural objects, more than one million of photographs, 700 movies and more than 6000 hours of traditional music and voice recordings and 8000 musical instruments. Scientific staff masters ten languages; consequently, the library and reprints are unusually multilingual.

- **ROYAL BELGIAN INSTITUTE OF NATURAL SCIENCES**
  (cf. *https://www.naturalsciences.be/)*

The Royal Belgian Institute of Natural Sciences deals with most fields of natural sciences: geology, zoology, palaeontology, molecular biology, oceanography and ecosystem studies. With approximately 37 million of specimens, the collections serve as reference and research tools.

The Natural History Museum is the visible part for the public. Its permanent galleries, temporary exhibition rooms and educational workshops welcome more than 300,000 visitors each year. Its Dinosaur Gallery is the largest in Europe and exhibit a large group of Iguanodon, a dinosaur found in Bernissart, Belgium. The research institute has a long tradition of tropical exploration worldwide and possesses large collections originating from central Africa, Asia, South America and Oceania.

Thesis

On March 10, 2017, **François DRUELLE** defended with fervour and skill his PhD thesis and obtained the degree of doctor in Sciences (Biology) at the University of Antwerp (Laboratory for Functional Morphology).

- ✓ <u>Locomotor anatomy and behaviour in olive baboons: integrative analysis from early infancy to autonomy</u>

Summary: The diversity of the environments in which baboons live demands specific locomotor activities (e.g. endurance walking, cliff climbing, etc.).
Hence locomotor capacities and the development thereof are key to their survival. To improve our understanding of these performances and how these relate to morphology and behaviour we studied an important period of the baboons's development, i.e. the transition from the onset of independent foraging to autonomy (from 5 months to 2 years old). We conducted a longitudinal follow-up of six infant olive baboons living in captivity at the Primatology Station of the CNRS in France. We studied, in parallel, the morphometrics, the temporal kinematics and the positional behaviour of these individuals. In addition, we had the opportunity to analyse longitudinal morphometrics, collected over a seven-year period, on a large sample of captive olive baboons (30 individuals) including the male and female parents of our infants. This enabled us to describe the full morphological development of this species and to embed our sample in a larger developmental frame. Furthermore, with regard to questions on the origin of human bipedalism and the relevance of primate models, we also analysed behavioural data on bipedalism collected on a crosssectional and ontogenetic sample of 22 baboons belonging to the same captive population.
First, our results show that the proportion of quadrupedal walking gradually increases on the expense of grasping behaviours during infancy. We observed that this pattern is highly correlated to changes in the body mass distribution, mainly at the level of the limbs where mass shifts proximally. While a more distal limb mass distribution reflects important grasping capacity for

clinging onto the mother's fur, more proximal masses into the limbs are adaptive for reducing energy consumption during quadrupedal locomotion. Second, our results show that the ontogenetic changes in the pattern of body mass distribution influence bipedal walking in juveniles and adults in terms of bout duration, i.e. in individuals that possess a lighter head on a heavier trunk show longer bipedal bouts. Third, during the early period of development, young baboons improve their interlimb coordination in quadrupedal walking. We found that the intrinsic morpho-dynamics of fore- and hind limbs (at the level of the convergence of the natural pendular period) have a significant and positive impact on this interlimb coordination pattern, thus probably facilitating, very early in development, the motor control and learning of quadrupedal walking. Finally, baboons occasionally walk spontaneously in a bipedal way and our results show that there is an improvement of the coordination of the hind limbs in this posture, coinciding to the development of interlimb coordination in quadrupedal walking. Hence, improvement of quadrupedal locomotor capacity does not exclude the development of bipedal behaviours, despite bipedal experiences remain rare in the ontogeny of baboons (<0.5% of their repertoire). This is also observed during chimpanzee ontogeny (Kimura and Yaguramaki 2009) and, therefore, sheds light on the emergence of new locomotor modes during the evolution of primates. Indeed, these results suggest a similar basic control mechanism in bipedal and quadrupedal locomotion. From an evolutionary perspective, we propose that secondary locomotor modes, such as bipedalism, experienced during infancy as by-products of locomotor development may lead to evolutionary novelties when under appropriate selective pressures.

Olive baboon (*Papio anubis*) ©Druelle

François Druelle's thesis cover ©

François DRUELLE (UA)

Recent publications

- ✓ Intergroup variation in robbing and bartering by long-tailed macaques at Uluwatu Temple (Bali, Indonesia)

Fany BROTCORNE[1, 2, 5], ***Gwennan GIRAUD***[1], ***Noëlle GUNST***[2], ***Agustín FUENTES***[3], ***I. NENGAH WANDIA***[4], ***Roseline C. BEUDELS-JAMAR***[5], ***Pascal PONCIN***[1], ***Marie-Claude HUYNEN***[1], ***Jean-Baptiste LECA***[2]

Primates (2017). Original article, first online: 17 May 2017

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Abstract: Robbing and bartering (RB) is a behavioral practice anecdotally reported in free-ranging commensal macaques. It usually occurs in two steps: after taking inedible objects (e.g., glasses) from humans, the macaques appear to use them as tokens, returning them to humans in exchange for food. While extensively studied in captivity, our research is the first to investigate the object/food exchange between humans and primates in a natural setting. During a 4-month study in 2010, we used both focal and event sampling to record 201 RB events in a population of long-tailed macaques (*Macaca fascicularis*), including four neighboring groups ranging freely around Uluwatu Temple, Bali (Indonesia). In each group, we documented the RB frequency, prevalence and outcome, and tested the underpinning anthropogenic and demographic determinants. In line with the environmental opportunity hypothesis, we found a positive qualitative relation at the group level between time spent in tourist zones and RB frequency or prevalence. For two of the four groups, RB events were significantly more frequent when humans were more present in the environment. We also found qualitative partial support for the male-biased sex ratio hypothesis [i.e., RB was more frequent and prevalent in groups with higher ratios of (sub)adult males], whereas the group density hypothesis was not supported. This preliminary study showed that RB is a spontaneous, customary (in some groups), and enduring population-specific practice characterized by intergroup variation in Balinese macaques. As such, RB is a candidate for a new behavioral tradition in this species.

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

D. COSTANTINI[1, 3], ***M. SEBASTIANO***[3], ***B. GOOSSENS***[4, 7], ***D.J. STARK***[4, 6]

Folia Primatol. 2017;88:46-56

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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.

- ✓ Effect of body mass distribution on the ontogeny of positional behaviors in non-human primates: longitudinal follow-up of infant captive olive baboons (*Papio anubis*)

***F. DRUELLE*[1,2,3], *P. AERTS*[4,5], *G. BERILLON*[6,7,8]**

(2016) American Journal of Primatology: 78(11):1201-1221

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Abstract: The diversity of primates' positional capabilities is unique among mammals. Indeed, they exhibit a daily repertoire composed of various locomotor and postural modes that may be linked to their particular morphological pattern. Because ontogeny undergoes parallel behavioral and morphological modifications, it may be useful to investigate the biomechanical consequences of the changing body shape. We, therefore, collected accurate quantitative and longitudinal data on positional behaviors, body mass distribution patterns, activities, and environment on a sample of six infant olive baboons, Papio anubis. These baboons are kept at the Primatology Station of the CNRS, France, where they live within the same social group. Individual behaviors were quantified using the focal sampling method. The body mass distribution was estimated according to a geometric model based on direct external measurements. Multivariate analysis enabled us to analyze the interactions between the data. Our results show that body mass distribution changes together with the ontogenetic changes in positional behaviors. At an early age, individuals have distally heavy segment masses in the limbs and an important fraction of the behavioral repertoire involves efficient grasping abilities. At the end of infancy, the same individuals have relatively more mass in proximal segments of the limbs and the proportion of quadrupedal walking is significantly higher while other climbing and suspensory behaviors decreased substantially. The present study experimentally confirms the association between body mass distribution and the positional repertoire of primates. These relationships, when interpreted in the context of basic biomechanical concepts, may improve our

understanding of primate locomotion. We discuss further the implications of these functional relationships when modeling the evolutionary pathway of primates.

- ✓ Persistence of the effect of frugivore identity on post-dispersal seed fate: consequences for the assessment of functional redundancy

***Ana Paula LUGON*[1, 2], *Marion BOUTEFEU*[1, 3], *Emilie BOVY*[1, 3], *Fernando Z. VAZ-DE-MELLO*[4], *Marie-Claude HUYNEN*[1], *Mauro GALETTI*[3], *Laurence CULOT*[2, *]**

BIOTROPICA Volume 49, Issue 3 May 2017, pages 293–302

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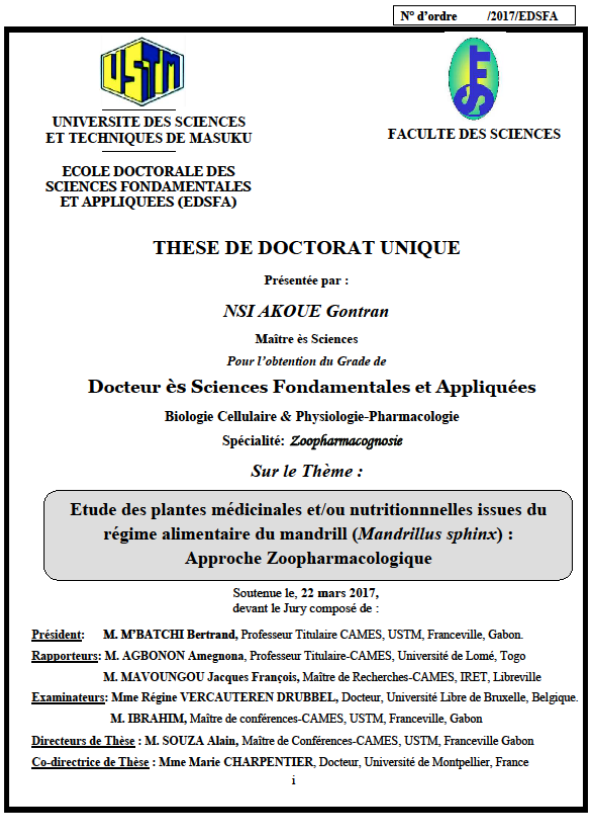
Abstract: Large frugivores play an important role as seed dispersers and their extinction may affect plant regeneration. The consequences of such extinctions depend on the likelihood of other species being functionally redundant and on how post-dispersal events are affected. We assess the functional redundancy of two seed dispersers of the Atlantic Forest, the muriqui (*Brachyteles arachnoides*) and the tapir (*Tapirus terrestris*) through the comparison of their seed dispersal quality, taking into account post-dispersal events. We compare tapirs and muriquis for: (1) the dung beetle community associated with their feces; (2) the seed burial probability and burial depth by dung beetles; and (3) the seed mortality due to predators or other causes according to burial depth. We determine how seed burial affects seed dispersal effectiveness (SDE) and compare the dispersal quality of four plant species dispersed by these frugivores. Muriqui feces attract 16-fold more dung beetles per gram of fecal matter and seeds experience 10.5-fold more burial than seeds in tapir feces. In both feces types, seed mortality due to predation decreases with burial depth but seed mortality due to other causes increases. Total seed mortality differ within plant species according to the primary disperser. Therefore, the effect of seed burial on SDE varies according to the plant species, burial depth, and primary disperser. As tapirs and muriquis differently affect the seed fate, they are not functionally redundant. Since the effect of the primary disperser persists into the post-dispersal events, we should consider the cascading effects of these processes when assessing functional redundancy.

News from abroad

On March 22, 2017, as jury member **R. VERCAUTEREN DRUBBEL** (ULB) attended the public PhD defence by **Gontran NSI AKOUE**, who obtained with great honour the degree of doctor in Sciences (specialisation: Zoopharmacognozy) at the Université des Sciences et Techniques de Masuku (USTM), Franceville, Gabon.



N° d'ordre /2017/EDSFA

UNIVERSITE DES SCIENCES ET TECHNIQUES DE MASUKU

FACULTE DES SCIENCES

ECOLE DOCTORALE DES SCIENCES FONDAMENTALES ET APPLIQUEES (EDSFA)

THESE DE DOCTORAT UNIQUE

Présentée par :

NSI AKOUE Gontran

Maître ès Sciences

Pour l'obtention du Grade de

Docteur ès Sciences Fondamentales et Appliquées

Biologie Cellulaire & Physiologie-Pharmacologie

Spécialité: *Zoopharmacognosie*

Sur le Thème :

Etude des plantes médicinales et/ou nutritionnnelles issues du régime alimentaire du mandrill (*Mandrillus sphinx*) : Approche Zoopharmacologique

Soutenue le, 22 mars 2017,
devant le Jury composé de :

Président: M. M'BATCHI Bertrand, Professeur Titulaire CAMES, USTM, Franceville, Gabon.
Rapporteurs: M. AGBONON Amegnona, Professeur Titulaire-CAMES, Université de Lomé, Togo
M. MAVOUNGOU Jacques François, Maître de Recherches-CAMES, IRET, Libreville
Examinateurs: Mme Régine VERCAUTEREN DRUBBEL, Docteur, Université Libre de Bruxelle, Belgique.
M. IBRAHIM, Maître de conférences-CAMES, USTM, Franceville, Gabon
Directeurs de Thèse : M. SOUZA Alain, Maître de Conférences-CAMES, USTM, Franceville Gabon
Co-directrice de Thèse : Mme Marie CHARPENTIER, Docteur, Université de Montpellier, France

- ✓ Study of medicinal and/or nutrional plants from mandrills (*Mandrillus sphinx*) diet: a zoopharmacological approach

Summary: In the research of plants with nutritional and therapeutic potential, a zoopharmacognosical study was carried out through a population of Mandrills living in the Lékédi Park in Southeast Gabon. The work covered two complementary approachs: (i) behavioral monitoring of Mandrills food intake, (ii) ethnopharmacological survey. Indeed, 57 Mandrill individuals living in Lékédi Park were monitored on a daily basis to acquire behavioral data on food intake. At the same time, an ethnopharmacological survey based on a semi-structured questionnaire on the traditional uses of plants consumed by the Mandrill was carried out among the populations of the Department of Lékoko. In addition to the survey, analyzes of the nutritional and pharmacological potential of certain plants consumed were carried out in the laboratory of Electrophysiology and pharmacology of University of Sciences and Techniques of Masuku (USTM).
The results obtained show that the Mandrills diet consists of 147 plant species belonging to 47 families. Those of the Rubiaceae and Euphorbiaceae were mainly consumed by the Mandrills. Fruits are the most consumed part of the plant. Analysis of food intake data shows that several factors determine the selection of certain food plants in Mandrill (plant bioavailability, seasonality, age and sex of individuals). It should also be noted that the consumption of three

plant species (*Manniophyton fulvum*, *Palisota ambigua* and *Elaeis guineensis*) was strongly correlated with the parasite prevalence thus suggesting self-medication behavior of the primate species. The results of the ethnopharmacological survey show that of the 147 plants consumed by the Mandrills, 86 are used as food and / or drugs. The results of the phytochemical analyzes reveal the abundance of secondary metabolites and reducing compounds in the majority of plants consumed by Mandrills. Some plants such as *Ricinodendron heudelotii*, *Pentaclethra macrophylla*, *Chrysophyllum africanum* and *Aframomum alboviolaceum* have a high calorie and mineral content. Others, such as *A. alboviolaceum*, *A. cf polyanthum* and *Pseudospondias longifolia*, exhibit antioxidant activities. Of all the plants tested, three plants possess bactericidal activity (*Medinilla mirabilis*, *Macaranga schweinfurthii* and *Tristemma mauritianum*). This study showed that the Mandrills would exploit the plant resources available in their ecosystems to improve their health and would also find a good source of energy and minerals.

Gontran NSI AKOUE surrounded by the Jury Members of his PhD thesis

Here is the abstract of **Gontran NSI AKOUE'** s recently published article:

- ✓ Seasonal and individual predictors of diet in a free-ranging population of mandrills
  Gontran NSI AKOUE [1], ***Wilfried MBADING-MBADING*** [2], ***Eric WILLAUME*** [3], ***Alain SOUZA*** [1], ***Bertrand MBATCHI*** [1], ***Marie J. E. CHARPENTIER*** [4, 5 *]
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Deciphering the dietary habits of a species is central to understanding its ecology, resource requirements, and the evolution of its life history traits. Detailed information on how primates use their environment to address their nutritional needs is available for many primate species. Such basic, but necessary data are, however, fragmented for secretive primates, especially regarding direct behavioral observations of individuals.

In this study, we evaluated the impact of seasonality and demographic characteristics on diet and feeding habits in the only free-ranging population of habituated mandrills (*Mandrillus sphinx*), a forest-dwelling species inhabiting the dense humid forests of Central Africa. We collected fine-grained quantitative data on feeding behavior of 57 individually-recognized animals of both sexes and different age classes during a 17-month period. We identified most consumed plant species and determined their abundance in the habitat of the studied mandrills. We showed that diet in this species was extremely diverse and included approximately 150 different plant species, but also mushrooms, invertebrates, and vertebrates. This omnivorous and highly diverse diet presented, however, a clear frugivorous tendency. While we identified three food items largely consumed throughout the year, we also found a strong seasonal signature on diet that was partly, but not only, related to food availability. Age and sex also influenced feeding habits with some feeding specializations according to the individual categories considered and their associated nutritional needs. Our quantitative data provide a basis for future studies examining the nutritional and mineral content of food items, which will further elucidate important aspects of the ecology of this little studied forest primate.

Mandrills (*Mandrillus sphinx*)
at Lékédi Park, Southeast Gabon
by Nsi Akoue ©

Gontran NSI AKOUE (USTM) on the field

Meetings Calendar

- ✓ **EFP 2017 Congress.** Date: August 22-25, 2017. Location: Strasbourg, France. Pre-program: August 21: French-speaking conference day, reserved for the members of the Société Francophone de Primatologie (SFDP), on the occasion of its XXXth anniversary. Conferences: August 22-24, 2017. Visit of the Primate Centre of Strasbourg University: August 25, 2017. Web site: http://www.alphavisa.com/efp/2017.

- ✓ **LTH ANNIVERSARY CONFERENCE OF THE PRIMATE SOCIETY OF GREAT BRITAIN** (Affiliated to the International Primatological Society and the European Federation of Primatology)**.** Date: November 27-29, 2017. Location: Royal Geographical Society, Corner Kensington Gore/Exhibition Road, London SW7 2AR. Two guest speakers, Dr Jane Goodall, DBE, patron of the Primate Society of Great Britain, Founder of the Jane Goodall Institute and UN Messenger of Peace, and Prof Frans de Waal, Dutch primatologist and ethologist, together with 9 past PSGB presidents and leading primatologists, will join in celebrating 50 years of primate research, conservation and welfare in the UK. Jane and a panel of experts will highlight priority areas for the next 50 years of primate conservation. Web site: http://www.psgb.org/meetings.php.

- ✓ **XXVIITH CONGRESS OF THE INTERNATIONAL PRIMATOLOGICAL SOCIETY (IPS).** Date: August 19-25, 2018. Location: Nairobi, Kenya. Only the fourth IPS congress staged in Africa, home to a hundred primate species. The second time in Kenya after 34 years. Web site: http://www.ipsnairobi.org.

Congress of the European Federation for Primatology
(Strasbourg, August 22-25, 2017)

After Belgium and Italy, this is the first time the EFP meets in France.
You may still subscribe (cf. http://www.alphavisa.com/efp/2017)!

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Régine VERCAUTEREN DRUBBEL (Université Libre de Bruxelles)

New book

Chimpanzee nests in palm trees ©*V. Leblan*

📖 Aux frontières du singe – Relations entre hommes et chimpanzés au Kakandé, Guinée (XIX^{e}-XXI^{e} siècle), Édition EHESS En temps et lieux, 2017

Vincent LEBLAN informed us of his new book (in French).

He is an anthropologist at the Institute of Research for Development (IRD, France) and is based at the Museum of Natural History in Paris. His research in West Africa brings together primate ecology, ethnology and environmental history in a common framework for the study of human-chimpanzee relationships.

Apes and monkeys appear to social scientists as located at the borders of their field of inquiry, while primatologists study them in order to explain cultural processes by biological models. The author reconsiders these two approaches and elaborates an anthropology of animals, while at the same time avoiding to subscribe out of principle to any notion of equivalence between simian and human competences. This book explores how chimpanzee behaviours (nest-building, feeding) emerge in relations to vegetation resources that are also of interest to humans. The reader is invited to follow, from the XIXth onwards, how people and chimpanzees coexist in the agro-pastoral environment of the Kakandé region of Western Guinea. This approach, which relies on a combination of ecological and ethnographic data and historical sources, also helps to put into perspective contemporary debates about the ecological and political dimensions of nonhuman primate conservation.

Primate Gossip