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BIODIVERSITY AND HEALTH IN THE TROPICS

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1000 Brussels

Session I

EMERGING INFECTIOUS DISEASES — ZOONOTIC DISEASES — VECTORS AND VECTOR BORNE DISEASES

Emerging infectious diseases, zoonotic diseases, vectors and vector borne disease

by

GRACE Delia^{1,*}

ABSTRACT. — In the second decade of the 21st century, our world has never been wealthier, healthier -- or more worried. Threats associated with diseases emerging from animals are especially prominent. The avian influenza and Ebola pandemics showed the death, disruption, and economic damage caused by zoonotic pandemics. Land-use change, agricultural intensification and biodiversity loss are considered drivers for emergence.

At the same time, livestock systems contribute immensely to human health through a range of direct and indirect pathways from provision of safe and nutritious foods to enhancement of psychosocial wellbeing to generating income for food and healthcare.

The International Livestock Research Institute (ILRI) is based in Nairobi, Kenya and has offices in several countries in Africa and Asia. Its mandate is to conduct livestock research with the objectives of reducing poverty, improving human nutrition and health, and safeguarding natural resources in developing countries. ILRI has been involved in One Health and emerging diseases for decades and this paper summarizes research, findings and impact for four important emerging diseases, three of which are zoonotic and two of which are vector borne: (Rift Valley fever (RVF), middle eastern respiratory syndrome (MERS), Ebola and African swine fever (ASF).

- RVF is a mosquito-borne viral zoonosis that mainly affects sheep, goats, cattle, buffaloes and camels. In people, the disease manifests as a mild influenza-like syndrome in most cases (> 80 per cent) or a severe disease with haemorrhagic fever, encephalitis, or retinitis in a few cases. ILRI research has focused on mathematical models, assessing economic and health burden, understanding community behaviour during outbreaks, developing risk maps and supporting contingency plans.
- MERS was first identified in 2012 in Saudi Arabia. Bats are the host though camels appear to play a significant role in maintaining the virus and in transmitting it to humans. ILRI mined its biobanks of historical camel samples confirming extensive exposure as far back as the early 1990s. We found the first seropositive human in Kenya during a OH study.
- Ebola virus has been responsible for deadly outbreaks, most recently in 2013-2016 in West and central Africa and presently in eastern Democratic Republic of the Congo. While bats are believed to be the reservoir, there is ongoing concern over the potential role of livestock in transmission or as dead end hosts, ILRI has conducted ex-ante assessments of the potential health risks associated with the pig value chain in Uganda.
- ASF is not a zoonoses, but it is emerging in Asia and threatening Europe. A deadly disease of pigs it could endanger food and nutrition security and economic development at massive scale. ILRI works on epidemiology of ASF, control in smallholder systems as well as vaccine development and are currently involved in the response to ASF in south-east Asia.

Using examples drawn from our experience in researching these four emerging diseases, we discuss the role of One Health and livestock research in better understanding and managing human diseases that emerge from animals.

¹Health Program Leader, Program Leader (joint) Animal and Human Health, Flagship Leader Food Safety A4NH, International Livestock Research Institute, Box 30709, Nairobi, Kenya.

*Corresponding Author. Email: D.Randolph@cgiar.org

Delia Grace

Delia is an epidemiologist and veterinarian with 20 years' experience in developing countries. She leads research on animal and human health at the International Livestock Research Institute in Kenya. Her research interests include food safety, emerging diseases, participatory epidemiology, gender studies and animal welfare. Her career has spanned the private sector, field-level community development and aid management, as well as research. She has lived and worked in Asia, west and east Africa and authored or co-authored around 200 peer-reviewed publications as well as training courses, briefs, films, articles and blog posts.

Spatial epidemiology and environmental niche modelling: considerations on ecological-realistic outputs

by

DA RE Daniele^{1,*} & VANWAMBEKE Sophie O.¹

KEYWORDS. — Medical geography; Pathogen distribution; Causal inference; Spatio-temporal modelling.

ABSTRACT. — Pathogen circulation is a complex ecological process defined by the interactions between pathogen, sometimes a vector, and hosts. The ever present threat of infectious disease to humans, livestock and wildlife have fostered interest in tools allowing to delineate areas at risk. Environmental Niche Models (ENMs) have been shown to provide such information and to map suitable areas for species involved in diseases [1-3]. However, many ENMs focus on a single species, often not the pathogen, and model outputs produce a presence suitability distribution without informing on abundance or temporality. Moreover, current ENMs studies mostly infer the target species' niche focusing on the abiotic niche only (e.g. temperature, precipitation, etc. conditions), rarely addressing the biotic interactions and thus resulting in a simplification of the complex diseases' niche system. Therefore, model outputs are often statistically rather than biologically relevant, but more subtle ecological mechanisms underlying pathogen circulation exist. As example, two ecological knowledge gaps of the multispecies Lyme disease system [4] can be underlined, being relevant also for other environment-sensitive pathogens: (i) the relationship between host abundance and vector abundance; (ii) the factors determining the abundance of important hosts, vectors (and pathogen) across time and space. To address these kind of specific questions, it is worth considering a causal-oriented theoretical framework, in order to arrive at robust causal explanations of the phenomena [5-7]. Here, we aim at increasing the awareness for a strong epistemological framework - which is ecologically-based - and develop ENMs further to incorporate a wider range of pathogens-vectors-host interactions.

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¹Country Earth and Life Institute, UCLouvain, Louvain-la-Neuve, place Louis Pasteur 3, 1348, Belgium

*Corresponding Author. Email: daniele.dare@uclouvain.be

Daniele Da Re

Daniele Da Re has a M.Sc. in Environmental Biology and he is currently a PhD student on Disease Biogeography at UCLouvain. He is mainly interested in species' spatio-temporal dynamics and species distribution models for epidemiological and biodiversity conservation purposes.

Biodiversity loss and disease emergence in the avian influenza epidemiological system

by

GILBERT Marius^{1,*}

KEYWORDS. — Avian influenza; Disease ecology; Emerging infectious disease; Agricultural intensification.

ABSTRACT. — The relationship between biodiversity and the emergence of emerging infectious diseases in domestic animals is poorly known, but is particularly important when those disease have a potential to infect humans. The example of avian influenza is illustrative. Low pathogenic avian influenza viruses (LPAIV) are naturally present with a high diversity of types and sub-types in the wild avifauna, and infect a high diversity of species with an infection that has a low clinical impact. Highly pathogenic avian influenza viruses (HPAIV), in contrast, have a low diversity with epidemics usually involving only one sub-type, and usually affect a limited number of domestic species with a high clinical impact. So, this epidemiological system shows a high stability and a low impact when there is both a high diversity of hosts and pathogens. Through a historical review of HPAIV emergences, we recently described that the conversion of LPAIV into HPAIV took place in intensive poultry production systems where the biodiversity of the poultry host is greatly reduced (Dhingra et al. 2018). We will present the potential mechanisms that may explain the association between HPAIV emergences and intensive poultry production conditions (Gilbert et al. 2017), and illustrated how recent HPAIV epidemics with zoonotic potential (H5N1, H7N9) have been linked to intensification of agriculture and of the poultry sector.

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¹ Spatial epidemiology lab (SpELL), Université Libre de Bruxelles, Brussels, Belgium.

*Corresponding Author. Email: mgilbert@ulb.ac.be

Marius Gilbert

Marius Gilbert graduated in Agricultural and Applied Biological Sciences at the Université Libre de Bruxelles in 1995. He was then a visiting researcher for two years at the department of Zoology, University of Oxford and did a PhD on insect pest ecology at the ULB in 2001. He then worked on the invasion ecology of several insect pests before moving the focus of his research toward the spatial epidemiology of animal diseases. In 2006, he was awarded a permanent academic position with the Belgian FNRS. Since 2015, he's FNRS Senior Research associates and leads the Spatial epidemiology Lab. (SpELL). Marius Gilbert has broad interests in the spatial epidemiology of animal diseases and invasive species. An overarching theme is the attempt to better understand how changes in agricultural systems have transformed ecosystems and affected the conditions of emergence, spread and persistence of pathogens and invasive species. His main area of expertise includes the epidemiology of avian influenza, global changes in livestock production systems, and livestock distribution models.

Evaluation of rodent control to fight Lassa fever based on field data and mathematical modelling

by

MARIËN Joachim¹, LEIRS Herwig¹ & FICHET-CALVET Elisabeth²

KEYWORDS. — Lassa virus; *Mastomys natalensis*; Rodent control.

ABSTRACT. — The Natal multimammate mouse (*Mastomys natalensis*) is the reservoir host of Lassa virus, an arenavirus that causes Lassa haemorrhagic fever in humans in West Africa. Because no vaccine exists and therapeutic options are limited, preventing infection through rodent control and human behavioural measures is currently considered to be the only option. In order to assess the efficacy of rodent control, we performed a 4-year field experiment in rural Upper Guinea and developed a mathematical model to simulate different control strategies (annual density control, continuous density control, and rodent vaccination). For the field study, rodenticide baits were placed each year in three rural villages, while three other villages were used as controls. Rodents were trapped before and after every treatment and their antibody status and age were determined. Data from the field study were used to parameterize the mathematical model. In the field study, we found a significant negative effect of rodent control on seroprevalence, but this effect was small especially given the effort. Furthermore, the rodent populations recovered rapidly after rodenticide application, leading us to conclude that an annual control strategy is unlikely to significantly reduce Lassa virus spillover to humans. In agreement with this finding, the mathematical model suggests that the use of continuous control or rodent vaccination is the only strategy that could lead to Lassa virus elimination. These field and model results can serve as a guide for determining how long and frequent rodent control should be done in order to eliminate Lassa virus in rural villages.

¹Evolutionary Ecology Group, University of Antwerp, Antwerp, Belgium

²Bernhard-Nocht-Institute for Tropical Medicine, Hamburg, Germany

*Corresponding Author. Email: jmarien@itg.be

Joachim Mariën

Joachim Mariën is a disease ecologist who currently works as a postdoc researcher at the outbreak research team in the Tropical Institute of Antwerp (clinical department). He has obtained his PhD in biology at the University of Antwerp (Evolutionary ecology group) in 2018. His work in the field has been concentrated to Sub-Saharan Africa, where he investigated the transmission dynamics of rodent and vector-borne viruses, including Lassa and Chikungunya virus. He has a keen interest in zoology, molecular biology and mathematical modelling.

Estimating the impact of WNV presence on humans and equines in Ecuador

by

SANCHEZ-MURILLO Marco¹ & RON-GARRIDO Lenin^{1,2,*}

ABSTRACT. — Afterward the attack of West Nile Virus (WNV) to New York (NY), in 1999, America was the last continent in presenting this disease. The WNV spread into the American States threatens health of human and equine populations. WNV has been reported in Caribbean and Central and South America including Venezuela, Colombia, and Brazil. The diversity of the ecosystems in Ecuador make suitable the presence of *Culex quinquefasciatus*, the main mosquito vector in tropical areas. Thus, the aim of this study was to search for the potential spatial distribution of *Cx. quinquefasciatus* using ecological niche modeling in Maxent software, and additionally to quantify the potential human and equine population under WNV risk. Bibliographic sources and the identification of mosquito species in the collection of the Entomology Unit at the International Centre for Zoonoses (CIZ) in Central University allowed distinguishing 28 presence-only locations suitable for *Cx. quinquefasciatus*. A set of WoldClim environmental variables plus Normalized Difference Vegetation Index (NDVI) and the altitude were used to model the ecological niche in Ecuador. NDVI during the dry period plus the altitude were the most important factors in determining *Cx. quinquefasciatus* presence. Almost 2 millions of people live in areas suitable for this mosquito. Biodiversity of migrating birds and the economic impact of the introduction of this virus in human and equine populations are important to evaluate in order to determine the public health impact of this potential emerging virus in Ecuador.

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¹ Instituto de Investigación en Salud Pública y Zoonosis // Universidad Central del Ecuador, Quito, Ecuador;

² Facultad de Medicina Veterinaria y Zootecnia / Universidad Central del Ecuador, Quito, Ecuador.

*Corresponding Author. Email: ljron@uce.edu.ec

Lenin Ron Garrido

Lenin Ron Garrido is Lecturer in Animal Genetics and Biostatistics at Faculty of Veterinary Medicine and researcher of the animal components of zoonotic diseases at the International Center of Zoonoses (CIZ) in Central University of Ecuador. He obtained his Master's degree in Biometry and breeding; and a Doctoral degree in Epidemiology. His research of interest is to contribute to the understanding of animal and livestock systems by using quantitative models in order to increase productivity and reducing the impact of tropical diseases and parasites.

Marco Sánchez-Murillo

Marco Sánchez-Murillo is a postgraduate researcher in spatial analysis and epidemiology of mosquito-borne diseases at the International Center of Zoonoses (CIZ) at the Central University of Ecuador. He obtained his degree in Veterinary Medicine and Zootechnics; and is a Master candidate in Epidemiology and Veterinary Public Health. His research of interest is about the spatiotemporal distribution of medical importance vectors, anticipating the possible impacts on public health and animal health.

Heterogeneity in tick abundance and pathogen presence in a peri-urban forest

by

ROUSSEAU Raphaël^{1*}, MORI Marcella², KABAMBA Benoit³, WOLTER Elliott¹ &
VANWAMBEKE Sophie O.¹

KEYWORDS. — Ticks; Tick-borne disease; Forest; Spatial heterogeneity; Multilevel analysis.

ABSTRACT. — Ticks constitute a threat for human and animal health, as they are vectors of various pathogens. Forests are considered the primary habitat for ticks because they provide favorable micro-conditions. As such, forests are often considered as a homogenous land cover harboring high tick populations. However, little is known about the heterogeneity in tick abundance within a forest, especially in areas where human exposure is high. In this study, we collected ticks in seven sites in the Bois de Lauzelle, a peri-urban forest in Louvain-la-Neuve. We selected sites to represent the diversity of the forest in terms of both human exposure and site characteristics, e.g. slopes, type of soil, distance to the forest edge, ground vegetation cover. These sites were sampled every two weeks during the seasonal period of tick activity, i.e. from March to November 2016. 959 nymphal and adult ticks were collected, stored, identified and screened for the presence of three zoonotic pathogenic agents: *Borrelia burgdorferi* s.l., *Coxiella burnetii*, *Francisella tularensis*, which are the causative agents of Lyme borreliosis, Q-fever and tularemia respectively. Tick abundance was temporally and spatially variable, with only the most typical site being consistently higher than the other sites. Mean abundance was lower in sites assumed to have a higher human exposure. Fine-scale predictors affected tick abundance but no clear association with pathogen presence was identified. Our results question the assumption that forest can be assumed to be a homogeneously suitable tick habitat, and underline the necessity to account for micro-environmental conditions and human exposure.

¹Earth & Life Institute, Georges Lemaître Center for Earth and Climate Research, UCLouvain, B-1348 Louvain-la-Neuve, Place Louis Pasteur, 3 bt.L4.03.08, Belgium

²Sciensano, department of Operational Direction Bacterial Diseases, B-1180 Ukkel/Uccle, Groeselenberg 99, Belgium

³Division of Clinical Biology, Cliniques Universitaires Saint-Luc, UCLouvain, B-1200 Brussels, Belgium

*Corresponding Author. Email: raphael.rousseau@uclouvain.be

Raphaël Rousseau

Geographer, PhD student in health geography

Polyvalent, hard-working and meticulous researcher in health geography, I acquired different skills in spatial modelling and epidemiology. I also discovered and improved my knowledge in multiple geographical fields during my enthusiastic involvement as teaching assistant. This position also helped me to present scientific works. My main research focus is to better understand the role of exposure in tick-borne diseases in forests and transition environments.

The influence of anthropogenic activities on communities of snail-borne parasites of public and veterinary importance

by

HAMMOUD Cyril^{1,2*}, MAES Tim³, VAN BOCXLAER Bert^{2,4}, VERSCHUREN Dirk²,
ALBRECHT Christian⁵ & HUYSE Tine¹

KEYWORDS. — Biodiversity; Anthropogenic activities; One Health; Gastropod; Trematode.

ABSTRACT. — The One World - One Health initiative urges researchers to work towards an integrated, holistic approach of Health issues considering that “humans, animals and the environment are inextricably linked” (van Helden et al. 2013). Within this framework, we attempt here to approach snail-borne diseases from the ecological community perspective and study the impact of human-induced environmental changes. To this end, we reviewed the recent literature regarding the effect of anthropogenic activities on communities of larval trematodes within their snail hosts. Trematodes are flatworms utilizing snails as intermediate hosts before infecting vertebrate species, including humans or cattle, as final host (Toledo 2016). Trematodes cause important human diseases such as schistosomiasis, a neglected tropical disease affecting more than 200 million people worldwide (Gryseels et al. 2006), but are also responsible for important economical losses in the livestock and aquaculture industries (Giannelli et al. 2016). Anthropogenic activities were shown to affect trematode communities through multiple mechanisms: loss of important final hosts; introduction of exotic snail species; alteration of the micro-habitat structure or of the physico-chemical characteristics of the aquatic environment. These processes are at play in two aquatic systems we are currently studying (the artificial lake Kariba – Zimbabwe (Carolus et al. 2019), and the Ndali-Kasenda cluster of crate lakes – Uganda). By focusing on these water bodies, we aim to provide additional insight into the aforementioned processes in areas where these parasites represent a potentially heavy burden on human, veterinary and wildlife healths.

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¹Royal Museum for Central Africa, Invertebrate Unit, Department of Biology, 3080 Tervuren, Belgium.

²Ghent University, Limnology Unit, Department of Biology, 9000 Ghent, Belgium.

³KU Leuven, Laboratory of Biodiversity and Evolutionary Genomics, Department of Biology, 3000 Leuven, Belgium.

⁴CNRS, Lille University, UMR 8198 – Evolution, Ecology, Paleontology, 59000 Lille, France.

⁵Justus Liebig University Giessen, Department of Animal Ecology & Systematics, 35392 Giessen, Germany.

*Corresponding Author. Email: Cyril.Hammoud@africamuseum.be

Cyril Hammoud

I am a highly motivated, naturally curious and proactive graduate. Being interested in understanding how Earth dynamics shaped Life's evolution (and reciprocally) made me passionate about ecology, biogeography and phylogeography and led me to achieve two masters, one in Biology and the second in Earth science. Still driven by the same passion, I am currently working on my Ph.D. at Ghent University on the biodiversity and biogeography of trematode parasites.

A multi-tier approach for identifying Dengue hotspots and simulating its spread

by

MARSBOOM Cedric^{1*}, PETRIC Mina¹, NICOLAS Gaëlle¹, HENDRICKX Guy¹, MASYN Serge³,
MENTEN Joris², HERRERA-TARACENA Guillermo⁶, KOPLEWITZ Gal⁵, CHIN Taylor⁵,
CLEMENTE Leonardo⁴, LUO Wei⁴, SANTILLANA Mauricio^{4,5} & VAN LOOCK Marnix³

KEYWORDS. — Dengue; Vector-borne diseases; Modelling.

ABSTRACT. — The global incidence of dengue has increased 30-fold between 1960 and 2010, with a recent study estimating that there are now 390 million cases per year worldwide. Dengue fever is a viral vector-borne infection mainly transmitted through the bite of both *Aedes aegypti* and *Aedes albopictus* mosquito species. The disease is endemic in more than 125 countries through four continents: Africa, Americas, south-east Asia, occidental Pacific and oriental Mediterranean. High impact of the infection on children (younger than 15 years old) was recognised since the 70's, leading to child hospitalization and deaths. We developed methods to map dengue hotspots on multiple scales, from global to municipality level. Our multi-tier approach aims at identifying global hotspots, predicting next year outbreaks and simulating local outbreaks. We simulated local outbreak patterns in two islands in the French West Indies (Guadeloupe and Martinique). First Dengue reports within the Antilles area, and particularly in Guadeloupe and Martinique, dates back to 1635 in which epidemics of a dengue-like syndrome were described. Hyperendemic circulation (recurrent circulation within the ecosystem) with an epidemic cycle of 2 to 5 years were observed in the presence of *Aedes aegypti*, the competent vector for the Antilles area, and the absence of *Aedes albopictus*. Currently, Dengue is a reportable priority disease in French territories. These results can be used to steer public health efforts during outbreak management and support clinical trial studies.

¹Avia-GIS, Risschotlei 33, 2980 Zoersel, Belgium.

²Quantitative Sciences, Janssen Pharmaceutica NV, Beerse, Belgium

³Janssen Global Public Health R&D, Janssen Pharmaceutica NV, Beerse, Belgium

⁴Computation Health Informatics Program, Boston Children's Hospital, Boston, MA, USA

⁵Department of Pediatrics, Harvard Medical School, Boston, MA, USA

⁶Janssen Global Public Health R&D, Janssen R&D US

*Corresponding Author. Email: cmarsboom@avia-gis.com

Cedric Marsboom

Belgian, MSc – Cedric graduated in 2014 as a Master of Science in environmental engineering (industrial engineer, environment and nature). His MSc thesis focussed on Vegetation dynamics in Nech Sar national park in Ethiopia. Through the use of remote sensing and GIS he was able to determine the leading dynamics behind the degradation of the national park. After his graduation he worked for two years on the ECOPLAN project at the university of Antwerp where he worked on hotspot mapping and modelling of ecosystem services in Flanders. In 2017, he joined Avia-GIS as a spatial analyst where he works on several research and technical development projects. Since 2019 he is CTO of Avia-GIS where he leads the R&D department and focusses on mathematical and spatial modelling.

Investigation of resistance in two important ubiquitous pathogens (*A. fumigatus* and *K. pneumoniae*) with the 'One Health' concept as missing link

by

PACKEU Ann¹, BOLAND Cécile² & GARCIA-GRAELLS Cristina³

KEYWORDS. — Drug resistance; Communicable Diseases; Emerging or Re-emerging; Surveys and surveillance.

ABSTRACT. — In order to fill some important gaps in the current monitoring of drug resistance in Belgium, two pathogens with a great public health implication which are not included in the annual AMR monitoring program have been chosen. The critical fungal pathogens *Aspergillus fumigatus* and the key amplifier and spreader of clinically important AMR genes living in humans, animals and the environment, *Klebsiella pneumoniae*. Both are a great threat in public health, cause severe and life threatening infections and are resistant to a number of critical important antimicrobials.

The use of tri-azole antifungals in agriculture has been linked to the emergence of azole resistance in clinical *A. fumigatus* strains. Antimicrobial-resistant *K. pneumoniae* strains, which are generally not recognized as a foodborne pathogen, have been isolated from marketed fresh vegetables, shrimp in international trade, and farm-raised chicken. Additionally, several critical resistance genes (a.o. carbapenemases genes) in *K. pneumoniae* are located in transferable genetic elements that may be transferred to other bacteria. Thus, the potential contribution of *K. pneumoniae* to the resistance of clinically relevant bacteria is cause for concern. Through this study, we will monitor the situation in Belgium in terms of resistance to antimicrobial agents. Secondly, the emergence of resistance in humans, animals and the use of drugs in the environment will be investigated. And finally, the prevalence of resistant isolates in humans, animals and the environment will be mapped in order to better understand the dynamic processes leading to adaptation to environmental pressure and biodiversity evolution caused by the use of pesticides or antibiotics for *A. fumigatus* and *K. pneumoniae*, respectively. The next generation sequencing will be used to further investigate the links between the different reservoirs, the association between resistance and use of drugs, and the key mode of transmission of drug resistant genes or strains. Currently, Belgian data on environmental strains are missing and are highly needed to fill the gap for the investigation of possible crossresistance and to have a complete overview of the different reservoirs contributing to the maintenance or emergence of drug resistance. All these results will be used for the establishment of recommendations, allowing policy makers to take the appropriate measures to preserve a sustainable ecosystem and minimize the risks for public and animal health.

¹Sciensano, Service of Mycology and Aerobiology, Brussels, Belgium

²Sciensano, Service of Veterinary Bacteriology, Brussels, Belgium

³Sciensano, Service of Food Pathogens, Brussels, Belgium

*Corresponding Author. Email: ann.packeu@sciensano.be

Ann Packeu

Dr. Ir.

Research Scientist

Sciensano, Service Mycology and Aerobiology

Responsible for the Medical Mycology Program from 1ste of May 2014

Responsible for the Aerobiology Program from 1ste of January 2015 till 1ste of January 2016

Academics

2005 Master of Bioscience Engineering at the Free University of Brussels (VUB)

2010 – 2005 PhD research “Interaction of classical and atypical neuroleptics with D2-dopamine receptors in intact cells”

Skills

Medical Mycology – Dermatophytes – Molecular Biology – Maldi-Tof MS – Aerobiology – Wet Lab

Experience — Pharmacology – Cell Culture

Project and team management experience

Climatological factors affect acaricide resistance distribution in Ecuador

by

PÉREZ-OTÁÑEZ Ximena¹, VANWAMBEKE Sophie O.², RON-GARRIDO Lenin¹
& RODRÍGUEZ-HIDALGO Richar^{1*}

KEYWORDS. — *Rhipicephalus microplus*; Resistance; Acaricides; Ecuador; Risk factors.

ABSTRACT. — Ecuador presents a great diversity of ecosystems and ecological niches for wildlife, domestic animals and livestock. Ecuador also has environments suitable for *Rhipicephalus microplus*, a cattle tick widely distributed in tropical and subtropical areas. In Ecuador, the livestock sector is one of the main economic activities; however, it is affected by ticks and tick-borne diseases. In addition, landscape diversity and climate variability affect tick abundance and tick-borne diseases such as babesiosis and anaplasmosis in livestock; the inefficient use of acaricides, lack of knowledge, poor technical support and inadequate public policies induce acaricide resistance and represents an environmental and public health concern. The aim of this study was to assess the distribution of acaricide resistance in *R. microplus* against: amitraz, ivermectin and alpha-cypermethrin and test the possible risk factors. 96 farms in the continental Ecuadorian territory between $\pm 0.5^\circ$ North and South were sampled. Larval package tests were used to evaluate the level of acaricide resistance. In this study, *R. microplus* was found between 0 to 2405 metres of altitude. There were 71.88%, 69.76% and 63.64% of resistances to amitraz, ivermectin and alpha-cypermethrin, respectively. Herd size increased significantly the resistances for each acaricide tested. Dairy farms had a higher risk of resistance to amitraz (OR=3.25; 2.5899-3.9103) and ivermectin (OR=1.83; 1.2472-2.4192). Ivermectin was associated with precipitation (OR=0.9994; 0.9990-0.99998), number of rainy days (OR=0.9817; 0.9690-0.9943), and highest precipitation month (OR=0.993; 0.9883-0.9977). No meteorological factors were statistically associated with amitraz and alpha-cypermethrin resistance. According to Vecino Cortés *et al.* 2010 *R. microplus* is found at altitudes over 2400 m.a.s.l. most likely due to climatic change and increased livestock areas. The decrease in acaricide efficacy also raises concern for environmental contamination and food safety (Martínez and Lumaret, 2006; Bello Velásquez, 2015). Further studies are needed to implement better livestock management control and environmentally- friendly strategies to reduce problems caused by ticks.

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¹Instituto de Investigación en Salud Pública y Zoonosis / Facultad de Medicina Veterinaria y Zootecnia / Universidad Central del Ecuador, Quito, Ecuador.

²Georges Lemaître Centre for Earth and Climate research, Université Catholique de Louvain, Louvain-la-Neuve, Belgium.

*Corresponding Author. Email: rrodriguez@uce.edu.ec

Ximena Pérez-Otáñez

Ximena Pérez-Otáñez is a Veterinarian from Central University of Ecuador, Master in Public Health and Veterinary Epidemiology at the same university. Currently she is an Associate Researcher at the Zoonosis Research Institute, she is currently collaborating on the project: "Molecular Epidemiology of the New world screw worm and Ticks". She has given several talks and presented posters in Ecuadorian seminars and congresses such as: "First livestock research meeting"; "I International Symposium on Tropical Bovine Livestock: Challenges for Sustainable Livestock"; "Zoonotic diseases originating from production animals"; among others. She has a scientific article in the journal PLOS-ONE and she won the second place in the 2018 Norval-Young award granted by the Tropical Veterinary Medicine Society , recognition to young researchers from around the world.

Sophie Vanwambeke

Sophie Vanwambeke is a geographer focusing on geography of public health. Using the tools of geography, such as spatial analysis and environmental monitoring, she investigates various health risks through the geographic lens of natural determinants of hazard and human determinants of exposure. She has a broad experience working on vector-borne and zoonotic diseases of humans and livestock, and more recently has been investigating mapping and exposure in the context of natural disasters. She has always worked with scientists from diverse backgrounds and is keen to collaborate across disciplines to produce original, society-relevant robust scientific results. She obtained her PhD in geography in 2005 and is a professor since 2007.

Lenin Ron Garrido

Lenin Ron Garrido is Lecturer in Animal Genetics and Biostatistics at Faculty of Veterinary Medicine and researcher of the animal components of zoonotic diseases at the International Center of Zoonoses (CIZ) in Central University of Ecuador. He obtained his Master's degree in Biometry and breeding; and a Doctoral degree in Epidemiology. His research of interest is contributing to the understanding of animal and livestock systems by using quantitative models in order to increase productivity and reducing the impact of tropical diseases and parasites.

Richar Rodriguez-Hidalgo

Richar Rodriguez-Hidalgo is a teacher of Public Health and Preventive Medicine at Veterinary Medicine and Zootechnic Faculty since 2009 and Researcher at Zoonoses Research Institute at Central University of Ecuador since 2002. Richar has studied at Tropical Medicine Institute in Antwerp and Gent University in Belgium where obtained a Master of Sciences and Doctoral in Veterinary Sciences degrees in 2002 and 2007, respectively. These degrees allow to focus in animal production diseases and zoonosis affecting human being. Nowadays, Richar is doing research in Ticks and tick-borne diseases, New world screwworm fly (NWSW, fasciolosis, among others. We have been doing research in collaboration with several institution in Belgium since 1997 and we publish relevant scientific information in several domains, included Taeniasis-cysticercosis, brucellosis, tuberculosis, ticks and NWSW.

The impact of man-made reservoirs on the transmission of gastropod-borne diseases in Zimbabwe

by

SCHOLS Ruben^{1,2}, CAROLUS Hans², HAMMOUD Cyril^{1,3}, BARSON Maxwell⁴,
Filip VOLCKAERT² & Tine HUYSE^{1*}

KEYWORDS. — Anthropocene; Artificial reservoirs; Trematodiasis; *One Health*.

ABSTRACT. — Gastropod-borne diseases (GBDs) affect more than 300 million people worldwide but also lead to economic losses and mortality in livestock (**WHO, 2018**). Schistosomiasis is one of the most prevalent tropical infections in Africa, affecting almost 200 million people in Sub-Saharan Africa. Other GBDs like fasciolosis and amphistomiasis cause huge losses and mortality in livestock worldwide (**Toledo, 2014**). The creation of embankments such as dams and dikes may create new habitats and disrupt the ecological and limnological conditions of water systems, often increasing the risk of water-borne disease transmission. Moreover, man-made reservoirs are vulnerable for invasive species, which could lead to an *invasional cascade* (Simberloff and Von Holle, 1999). Here we study the gastropod and trematode species found in lake Kariba, the biggest artificial lake in the world by volume. We found that high densities of the invasive waterhyacinth correlated with high abundances of an invasive gastropod that originates from North America (Carolus et al., 2019). Molecular xenomonitoring showed large populations of these snail species to be infected with an unknown *Fasciola* species that is closely related to *F. hepatica*. In addition, by sequencing adult worms collected from wildlife and livestock from abattoirs we could demonstrate that hippopotami act as final host species of this *Fasciola* species.

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¹Department of Biology, Royal Museum for Central Africa, Tervuren, Belgium.

²Laboratory of Biodiversity and Evolutionary Genomics, KU Leuven, Leuven, Belgium.

³Limnology Research Unit, Ghent University, Ghent, Belgium.

⁴Department of Biological Sciences, University of Zimbabwe, Harare, Zimbabwe.

*Corresponding Author. Email: tine.huyse@kuleuven.be

Ruben Schols

Ruben Schols graduated from the KU Leuven as a Biologist in 2019. During his studies he assisted some very interesting research projects. Two years ago, he contributed significantly to the intense sampling campaign of PhD student Io Deflem (KU Leuven) in her attempt to study the health of fish populations in Flanders. The same year he studied the parasite community of the invasive fish *Ameiurus nebulosus* in Belgium for his bachelor's thesis under Dr. Pascal Hablützel (KU Leuven). Pascal, currently employed at the Flanders marine institute (VLIZ), also supervised Ruben during the summer of 2019 while he mapped the biodiversity in the harbour of Ostend. The year after, he got the amazing opportunity to join Dr. Tine Huyse and Aspire Mudavanhu in their quest to study the trematode community in the Witrivier in South Africa after nearly 40 Belgian tourists got schistosomiasis when visiting the area. This experience sparked his interest in the amazingly diverse world of trematode parasites. To develop his interests even further he studied the trematode communities of man-made reservoirs in Zimbabwe during his masters' thesis at the Royal Museum for Central Africa (RMCA) and KU Leuven. The studies he contributed to have already resulted in two published peer reviewed papers written by his research group at the RMCA. Now, they are creating more papers as there is still a significant amount of interesting data to be reported. Besides the creation of novel papers, he is aspiring to start a PhD on trematode parasites at the KU Leuven in collaboration with the Royal Museum for Central Africa in 2020.

Prioritizing Lyme borreliosis risk areas for forest and nature management based on novel insights in tick ecology

by

VAN GESTEL Mats^{1,2,*}, VERHEYEN Kris², HEYLEN Dieter^{3,4} & MATTHYSEN Erik¹

KEYWORDS. — Ticks; Lyme borreliosis; Forest management; *Ixodes Ricinus*; Applied ecology.

ABSTRACT. — The risk of tick-borne disease depends on the exposure to pathogen-infected ticks, driven by local tick population densities, pathogen prevalence and human activity (Verheyen & Ruyts, 2016). the variation in tick densities and pathogen prevalence among forest stands differing in habitat characteristics and geography have been studied well. In contrast, variations within forest stands, although vital for forest management and disease risk reduction, remain largely unstudied. Studying small-scale variations may lead to better understanding of the heterogeneous tick distributions within forest stands. We present a methodological approach that integrates fine-scale habitat assessment, drag sampling of ticks, screening for pathogens and camera trapping of tick hosts within public forests at five location types. These sub-locations represent varying recreational pressure: (1) a structural element (e.g. bench), (2) 40 meters further along the adjacent trail, (3) the interior of the associated forest plot, (4) play areas and (5) forest edge trails. Our approach explores associations between the density of infected nymphs (DIN), recreational pressure and host diversity (community composition and habitat use). Drag sampling and camera trapping take place in spring and summer of 2019-2021 at 42 locations in 10 forests. A pilot study was conducted in 2018 at 36 locations, for location types 1-3. Data obtained over the 2018-2019 period demonstrate low density of nymphs (DON) at structural elements (1) and intermediate DON adjacent to trails (2 and 5). Significantly more ticks were captured in the forest interior (3). We conclude that the proposed design is fit to test our hypotheses over the coming years.

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¹Evolutionary Ecology, Department of Biology, University of Antwerp, Wilrijk, Belgium.

²Forest and Nature Lab, Department of environment, University of Ghent, Gontrode, Belgium.

³Department of Ecology and Evolutionary Biology, Princeton University, Princeton, NJ, United States of America.

⁴Interuniversity Institute for Biostatistics and statistical Bioinformatics, Hasselt University, Diepenbeek, Belgium.

*Corresponding Author. Email: Mats.vangestel@uantwerpen.be

Mats Van Gestel

Mats Van Gestel studied at the university of Antwerp, where he got his Bachelor's degree in Biology. Subsequently, he specialized in evolutionary and behavioral biology for his master's degree, working on a thesis concerning the host specificity of Arenaviruses in their natural host: *Mastomys natalensis*. He is currently enrolled as a PhD student at EVECO (University of Antwerp) and ForNaLab (UGhent). His current project aims to reduce the risk of tick borne diseases through a better understanding of the mechanisms driving tick and pathogen densities. This project is co-supervised by Prof. Dr. Erik Matthysen, Prof. Dr. ir. Kris Verheyen and Dr. Dieter Heylen and has been funded by an FWO-SB grant.

Evidence of multiple mechanisms of alphacypermethrin and deltamethrin resistance in ticks *Rhipicephalus microplus* in Benin, West Africa

by

YESSINOU Roland Eric^{1*}, AKPO Yao³, SIDICK Aboubakar², ADOLIGBE Camus¹, YOUSAO ISSAKA
KARIM Abdou¹, AKOGBETO Martin² & FAROUGOU Souaïbou¹

ABSTRACT. — Ticks are obligate haematophagous arthropods, causing heavy losses in affected livestock. The objective of this study is to investigate phenotypic and genotypic resistance in *Rhipicephalus microplus* populations from Benin. Engorged female adult ticks were collected from cattle in two districts of Benin. Bioassays, biochemical and molecular tests were carried out on these ticks to determine the phenotypic, enzymatic and genetic status of resistance. Results of bioassays showed high resistance factors (RF > 41). The molecular tests showing the presence of the domain II mutation and absence of the domain III mutation in the voltage-gated sodium channel gene. Biochemical tests showed increased activity of esterases, multifunction oxidases and glutathione transferases in resistant samples. Genotyping the samples showed high levels of heterozygous genotypes (73.36% and 63.30%) as compared to homozygous susceptible and resistant genotypes (23.3% and 10%) respective at Samiondji and Betecoucou. A correlation between phenotype resistance and presence of the domain II mutation at the voltage gated sodium channel gene was observed suggesting that this could be associated with resistance. Target site mutation and metabolic detoxification are mechanisms of resistance to pyrethroids in *R. microplus* tick populations from Benin.

¹University of Abomey-Calavi (UAC), Polytechnic School of Abomey-Calavi (EPAC) Production and Animal Health Department, Unit of Biotechnology in Production and Animal Health (URBPSA), 01 PO Box: 2009, Cotonou, Benin.

²Entomological Research Center of Cotonou (CREC), 06 BP 2604, Cotonou, Benin.

³Laboratory of Ecology, Health and Animal Production, Faculty of Agronomy, University of Parakou, P.O. Box 123, Parakou, Benin.

*Corresponding Author. Email: eric.yessinou@uac.bj

Eric Yessinou

He is an innovative and result-oriented person with major interest in the Medical Entomology world focusing on scientific goals and development, community empowerment and public-private sector partnership through value chain analysis of scientific processes in order to eliminate inefficiencies. With a Bachelor, Master and PhD degree in Medical Entomology, he hopes to lay sound, practical and viable solutions in the field through a consultative approach.

Education

2014-2018: PhD of Medical and Veterinary Entomology-Acarology

2011-2014: Master in Medical and Veterinary Entomology

2007-2010: Bachelor of Natural Science Degree

2004: High School Diploma

Work and professional experience

October 2014-: University of Abomey-Calavi, Polytechnic School of Abomey-Calavi, Communicable Disease Research Unit

Exact title of the post: Researcher

Duties and responsibilities: Teaching zoology, entomology-acarology and biophysics. Help draft formal/official presentations and papers of research findings to external audiences; contribute to the research design and field studies in relation to the project; carry out field work in consultation with the Principal Investigator and Project Coordinator; record, analyses and write up the results of the field studies; Prepare and present findings of research activity to colleagues for review purposes; help prepare progress reports on research for funding bodies as required; contribute to the preparation and drafting of research bids and proposals.

March 2012- : University of Abomey-Calavi, Polytechnic School of Abomey-Calavi, Department of Production and Animal Health.

Exact title of the post: Technician of laboratory

Duties and responsibilities: practical activities in Zoology, Parasitology (Agent pathogen and Entomology-Acarology Identification), PCR and ELISA test to students in bachelor's degree program at Department of Production and Animal Health.

SESSION II

**APPLIED BOTANY —
MICROBIOLOGY — ZOOLOGY
— ETHNOBOTANY &
MEDICINAL PLANTS**

Ethnopharmacology and antimalarial compounds from tropical plants

by

Michel FRÉDÉRICH*

ABSTRACT. — Malaria is caused by a protozoan parasite *Plasmodium* sp. and transmitted by *Anopheles* mosquitoes. The problem of parasite resistance towards common available medicines such as chloroquine, mefloquine, quinine, and more recently artemisinin and its derivatives, is a real threat in the control of the disease and in this context, the discovery of new treatment is urgently needed. Despite some improvements in malaria control in the last years, this parasitic disease remains a major public health problem causing about 435 000 deaths from 219 million cases in 2017 worldwide, 93% of these death being located on the African continent, and mainly by children under the age of five¹. In this context, the laboratory of Pharmacognosy of Liège (Belgium) is involved in several collaborations with African Universities and Research Centers for the research and the analysis of plants and natural products that can be valorized for malaria treatment. One recent and important direction of research is the use of *Artemisia* sp. for the prevention and treatment of malaria. Projects concerning these plants will soon start in Cameroon and Rwanda. Another direction of research is the discovery of new antimalarial pure compounds that could be used as lead compounds to design new antimalarial drugs. Three projects of the laboratory will be shortly presented. The first one concerns a screening of endemic plants from Reunion island that lead to the discovery of a poupartone B, a compound presenting some toxicity concerns but whose toxicity could be decreased by recourse to vectorization. The second project started from a screening of Rwandan traditionally used plants and lead to the identification of the highly antiplasmodial compound ellagic acid and the development of semi-synthetic derivatives of this compound. The third project concerns bisindole alkaloids from *Strychnos* species. Some of these alkaloids presenting high *in vitro* and *in vivo* antiplasmodial activity could be considered as lead compounds. New metabolomics strategies are actually developed in order to identify minor bisindolic alkaloids with very high activities.

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*Université de Liège, Center for Interdisciplinary Research on Medicines, Pharmacognosy Laboratory, Department of Pharmaceutical Sciences, University of Liège, Belgium.

*Corresponding Author. Email M.Frederich@uliege.be

Michel Frédérich

He was graduated Pharmacist in 1996 at the University of Liège (Belgium) where he obtained his PhD in Pharmaceutical Sciences in 2000, and the *Agrégation de l'Enseignement Supérieur* degree in 2007. He realized during the year 2003 a postdoctoral stay in the laboratory of Pharmacognosy of Professor Verpoorte at the University of Leiden (Netherlands). Laureate of three awards, he was Senior Researcher at the F.N.R.S. (Fond National de la Recherche Scientifique) from 2004 to 2010. In 2010 he became lecturer at the University of Liège and he is currently full Professor in Pharmacognosy. Author of more than 150 international publications, his fields of research are Natural substances with antiplasmodial, antitumoral and anti-inflammatory properties, plant metabolomics and herbal medicines quality control.

Degrees:

Graduated Pharmacist in 1996, **PhD in Pharmaceutical Sciences** in 2000 (University of Liège).

Postdoctoral stay in Leiden University (Laboratory of Professor Rob Verpoorte) from 10/2003 to 06/2004.

Awards: Laureate of "Glaxo Wellcome Grant for the Study in Infectiology and Clinical Microbiology" en 1998, of "Pharmaton price of phytothérapie" en 2001, and of "Prix Comte de Launoit des Amis de l'Université de Liège in 2008".

Professional experience:

Senior Researcher at FNRS (2004-2010).

Lecturer in Pharmacognosy at University of Liège since 2010. **Full Professor** since 2015.

Other activities: Vice-President of the Belgian board for registration of herbal medicines.

Expert at European Pharmacopoeia (Strasbourg).

Fields of research: Natural substances with antiplasmodial, antitumoral and anti-inflammatory properties. Plant metabolomics. Herbal medicines quality control.

Invasive species, health and local knowledge in tropical wetlands: Santo Tomas, Colombia and Cerrón Grande, El Salvador

by

ESCOBAR Kelly¹, CASELLES Aracelly^{2*}, ROVIRA María Dolores & DíEZ Adriano³

KEYWORDS. — Invasive species; Health; Local knowledge; Tropical wetlands; Colombia-El Salvador.

ABSTRACT. — Those who promote and ensure the health and safety of vulnerable rural populations living near tropical wetlands and expanding cities, need to understand what people think and how they respond to the problems imposed by these environments, this research describes the ways in which the local population surrounding two tropical wetlands conceives the proliferation of invasive species and their impacts on human health (Horwitz & Finlayson, 2011). The sites selected for the study are the Ciénaga de Santo Tomás in Colombia (Becares, 2016; Rinjders, 2017) and the Cerrón Grande Reservoir in El Salvador, both scenarios receive population that, due to violence, have transited between rural and urban habitats throughout their regions originally. Through a mixed and interdisciplinary methodology (INVAWET, 2016), the results of the research show that the lack of knowledge and information about the effects caused by these exotic entities on human health and ecosystem health could deepen their current vulnerability. In addition, some emerging ways of knowing and managing the environment and its impacts on health are described, in the midst of the cross-linking of scientific knowledge and local knowledge.

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¹Universidad del Atlántico, Barranquilla, 080004, Colombia.

³Universidad Centroamericana José Simeón Cañas, El Salvador, El Salvador.

⁴Universidad del Atlántico, Barranquilla, 080004, Colombia.

*Corresponding Author. Email: kellyescobar@mail.uniatlantico.edu.co

Kelly J. Escobar Jiménez

Investigador Junior (IJ) (con vigencia hasta 2019-12-05 00:00:00.0) - Convocatoria 781 de 2017

Formación Académica

Doctorado Université de Liège

Département de Sciences et Gestion de l'Environnement

Septiembre de 2008 – Octubre de 2012

Lorsque les limites des sciences et les sentiers de chasse s'entrecroisent : Une ethnographie des laboratoires scientifiques amazoniens en partenariat avec les communautés autochtones locales

Pregrado/Universitario UNIVERSIDAD DEL ATLÁNTICO

Sociología

Enero de 2001 - Julio de 2007

Gestión del Medio Ambiente: Aproximaciones teóricas y metodológicas de la sociología en el caso del desarrollo ecoturístico de la Vía Parque Isla de Salamanca

Perfeccionamiento Universidad libre de Bruselas

Diplomado en Ecoturismo

Agosto de 2003 - Enero de 2004 **Perfeccionamiento** Université Catholique de Louvain

Institut de pédagogie universitaire et des multimédias

Junio de 2011 - Junio de 2011

Perfeccionamiento UNIVERSIDAD DEL ATLÁNTICO

Didácticas de la docencia universitaria

Abril de 2006 - Julio de 2007

Experiencia profesional UNIVERSIDAD DEL ATLÁNTICO

Dedicación: 40 horas Semanales Enero de 2013 de

Université de Liège

Dedicación: 40 horas Semanales Septiembre de 2008 Septiembre de 2012

Actividades de investigación

Establishing new legume-based farming systems in Northeast Thailand using drought-tolerance traits of wild legume and rhizobia populations

by

FORDEYN Stephanie*

KEYWORDS. — Tropical Agriculture; Biotechnology; Legume-rhizobia symbiosis; Northeast Thailand.

ABSTRACT. — Food self-insufficiency remains a challenge in Northeast Thailand causing widespread malnutrition and extreme poverty. The Northeast experiences the lowest levels of agricultural productivity even though most of its population is engaged in agriculture (1). Limited resources and fragmented guidelines to cropping strategies exacerbate the recurring issues of soil nutrient depletion and prolonged drought periods (2). Targeting these restraints, this research acknowledges the potential benefits of wild legumes (3). Besides being vigorous during drought, legumes that engage in symbiosis with rhizobia bacteria can perform Biological Nitrogen Fixation (BNF); a process that converts atmospheric N to plant usable forms (4). Given that N is required for plant growth in large quantities, BNF is vital to productive agriculture, offering an alternative to synthetic fertiliser-N (5).

The aims of this research are 1) to exploit the genetic biodiversity among wild legumes and rhizobia pairs that exhibit drought-tolerance and BNF traits for integration to Northeast Thailand's cropping systems and 2) to provide solid guidelines to legume establishment. Farming objectives and typologies were identified by evaluating over 500 questionnaire responses from farmers across 5 districts in Khon Kaen. To identify superior symbionts, whole rhizobia communities will be profiled and discerned through targeted isolation and identification using MALDI-TOF MS and amplicon sequencing of the 16S rRNA, *gyrB* and *nifH* genes. Isolate effectiveness will be assessed by measuring host parameters associated with Nitrogen fixation efficiency. In addition, in-field assessment of legume-based cropping systems will be performed in Northeast Thailand to evaluate the performances of pre-selected legume-rhizobia symbionts.

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*Laboratory for Microbiology, University of Ghent, Karel Lodewijk Ledeganckstraat 35, 9000 Ghent, Belgium and Rhizosphere Group, VIB-UGent Center for Plant Systems Biology, Technologiepark-Zwijnaarde 71, 9052 Ghent, Belgium.

*Corresponding Author. Email: stephanie.fordeyn@ugent.be

Stephanie Fordeyn

In 2016, Stephanie Fordeyn completed her BSc in Plant Science at the University of Edinburgh, Scotland. During her final year at Edinburgh, Stephanie performed research on the biodiversity and biogeography of European legumes which spurred her interest for legume symbioses. From then, Stephanie went on to do a BSc's dissertation on legume-rhizobia mutualisms, focusing on tropical and semi-arid species growing in the glasshouses of the Royal Botanical Garden of Edinburgh. At the time, she had the opportunity to work in close collaborations with world experts on legumes, Prof. Gregory J. Kenicer, Prof. Euan K. James and Prof. Janet I. Sprent. Through a crowd-funded project in 2017, Stephanie commenced a fieldwork on legumes native to her home country, Thailand. The following year, further research was done on Thai legumes during which Stephanie conducted her MSc in Plant Biotechnology at Ghent University, Belgium. Her MSc thesis, termed 'Isolation and Identification of Nitrogen-fixing Symbionts in Wild Legumes of Northern Thailand: a Prospect for Tropical Agriculture' was supervised by Prof. Anne Willems and Prof. Sofie Goormachtig. In January 2019, Stephanie began her PhD research 'Establishing new legume-based farming systems in Northeast Thailand using drought-tolerance traits of wild legume and rhizobia populations' at the Laboratory of Microbiology, LM-UGent and at VIB-UGent Center for Plant Systems Biology under the guidance of her MSc supervisors. The current work is also a result of joint efforts between Ghent University and the Office of Agricultural Research and Development Region 3, Khon Kaen, Thailand, as well as the James Hutton Institute, Scotland.

Anthelmintic screening of five species used in Traditional Medicine in Katanga Province (DR Congo)

by

NZUZI M. Gaël^{1,2,3}, MUYUMBA N. Welcome^{2,4}, GAUTHIER Marie-Lou², PANDA Sujogya K.⁵, LUYTEN Walter⁵, NACHTERGAEL Amandine², VANDENPUT Sandrine³, BAKARI Salvius A.⁶,
OKOMBE E. Victor¹ & DUEZ Pierre²

KEYWORDS. — Medicinal plants ; Veterinary medicine ; *In vitro* screening ; *Caenorhabditis elegans*; Extracts.

ABSTRACT: —

Aim of the study: Resistance to known anthelmintics has become a growing concern¹. Based on 2017–2019 ethnomedical and ethnoveterinary surveys carried out in Katanga Province, several species of shrub locally identified as *Vitex* species (Lamiaceae) are used to treat helminthiasis. In this study, 5 of these species, including different morphotypes, were selected for *in vitro* screening in order to search for new anthelmintic lead compounds.

Method: n-heptane, dichloromethane (DCM), ethyl acetate (EtOAc) and methanol (MeOH) extracts of selected plants (leaves, root barks and stem barks) were evaluated for their anthelmintic activity. The experiment was assessed using a standard motility assay on the N2 wild-type *Caenorhabditis elegans* strain².

Results: Anthelmintic activity was confirmed by the calculation of motility inhibition. The following extracts, tested at 200 µg extract/mL, were significantly active on this model (average ± SD; n = 3; positive control, levamisole, 50 µM : 98.7 ± 4.3 % of motility inhibition) : *Oldfieldia dactylophylla* (Welw. ex Oliv.) (Picodendraceae; locally misidentified as *V. congolensis* De Wild and T. Durand) [DCM leaves (71.0 ± 5.7 %), MeOH stem barks (90.0 ± 7.3 %) and MeOH stem roots (97.0 ± 5.9 %)] ; *V. doniana* Sweet [EtOAc leaves (64.0 ± 4.4 %)] ; *V. fischeri* Gürke [n-heptane leaves (98.0 ± 7.8 %)] ; *V. madiensis* subsp. Milanjiensis (Britten) F.White [DCM leaves 3-5 leaflets (65.0 ± 5.6 %) and 5 leaflets (69.0 ± 6.6 %)] and *V. mombassae* Vatke [DCM leaves 3-5 leaflets (62.0 ± 8.1 %)].

Conclusion: The motility inhibitions measured on the N2 wild-type *Caenorhabditis elegans* model provide support for the traditional use of these plants and call for further studies to develop compounds as possible treatments for parasitic worm infections. The misidentification of *Oldfieldia dactylophylla* seems to be general in the study region.

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¹University of Lubumbashi (UNILU), Unit of Pharmacology and Therapeutic, Faculty of Veterinary Medicine, 1825, Lubumbashi, DR Congo.

²University of Mons (UMONS), Unit of Therapeutic Chemistry and Pharmacognosy, 7000 Mons, Belgium.

³University of Liège (ULiège), Bibliothèque des Sciences de la vie, 4000 Liège, Belgium.

⁴Department of Chemistry-physics, High college training teachers of Lubumbashi, Lubumbashi, 1825, DR Congo.

⁵Department of Biology, Animal Physiology and Neurobiology Section, KU Leuven, Naamsestraat 59, box 2465, 3000 Leuven, Belgium.

⁶University of Lubumbashi (UNILU), Laboratory of Pharmacognosy, Faculty of Pharmacy, 1825, Lubumbashi, DR Congo.

*Corresponding Author. Email: mavungug@unilu.ac.cd;

Gael.NZUZIMAVUNGU@student.umons.ac.be

Gaël Nzuzi Mavungu

University of Lubumbashi (DR Congo) / University of Mons (Belgium)
Pharmacology, Toxicology and ethnoveterinary medicine service

Carreer

- Lecturer at the University of Lubumbashi (2013-)
- Co-Director of the Naviundu farm of Unilu (2015-)
- Secretary at the preclinic department, Fac Medvet, University of Lubumbashi
- Researcher in ethnoveterinary medicine (2015-)
- PhD student at University of Lubumbashi (DR Congo) and at University of Mons (Belgium) – (2017-2022)

Research interests

- Ethnoveterinary praticies
- Biological activities of medicinal plants
- Pharmacology and toxicology research

Les vertus médicinales des plantes et champignons chez les Mbènzèlè et Ngombe du Congo

par

ATIKANI Gallion B.^{1*}, EBIKA NDOLO Sydney T.² & ATTIBAYEBA²

MOTS-CLÉS. — Connaissance endogène; Ethnobotanique; Médecine traditionnelle.

RÉSUMÉ. — La forêt représente la principale source d'approvisionnement en nourriture et médicaments pour les populations autochtones Mbènzèlè et Ngombe au Nord de la République du Congo. D'après Bremness (1996), il y a plus de 20.000 plantes utilisées comme condiments et médicaments dans le monde. Plusieurs autres plantes sont aussi décrites pour avoir des propriétés médicinales en Afrique (Saulnier, 1998). En ce qui concerne les champignons, Okigbo & Nwatu (2015) et Ndolo Ebika *et al.* (2018) ont rapporté que certaines espèces sont utilisées pour traiter les maladies. Dans le but de connaître comment ces populations autochtones font pour se soigner, nous avons réalisé des enquêtes ethnobotaniques en juin 2012, février 2013 et Octobre 2016 à Bomassa et Makao au Nord Congo. Les résultats montrent que ces populations utilisent beaucoup plus les plantes que les champignons pour la pharmacopée traditionnelle. Au total, 20 espèces de plantes et 3 espèces de champignons sont utilisées pour traiter 16 maladies. Les espèces végétales sont: *Alchornea cordifolia*, *Alstonia boonei*, *A. congensis*, *Cassia occidentalis*, *Cercestis* sp., *Cleistanthus mildbraedii*, *Copaifera mildbraedii*, *Cyathula achyranthoides*, *Dichrostachys cinerea* subsp. *platycarpa*, *Drypetes capillipes*, *Hunteria ballayi*, *Irvingia excelsa*, *Justicia secunda*, *Manniophyton fulvum*, *Monodora myristica*, *Morinda morindoides*, *Omphalocarpum* sp., *Physalis angulata*, *Pycnanthus angolensis* et *Thomandersia hensii*. Les espèces fongiques utilisées sont toutes des Basidiomycètes à savoir *Auricularia cornea*, *A. delicata* et *Lentinus squarrosulus*. Les maladies traitées sont, entre autres, le paludisme, la diarrhée et la dysentérie amibienne. Six parties de plantes (écorces, feuilles, graines, inflorescences, moelle, tige) sont utilisées dans le traitement de ces maladies. Les feuilles sont les parties les plus utilisées avec 44% suivies des écorces avec 31% et des tiges avec 17%. Pour les champignons, il s'agit de tout le carpophore qui est utilisé. De futures études seront envisagées afin de parfaire les connaissances scientifiques et documenter le savoir endogène des populations autochtones du Nord Congo.

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¹Initiative des Champignons et des Plantes du Congo, Brazzaville, B.P. 2300, République du Congo.

²Faculté des Sciences et Techniques, Brazzaville, B.P. 69, République du Congo.

*Corresponding Author. Email: gatikani@gmail.com

Gallion B. Atikani

EXPERIENCE DE RECHERCHE

Janvier 2016 – Présent : Assistant de Recherche. Initiative des Champignons et des Plantes du Congo (ICPC), Brazzaville, République du Congo. Responsabilités : Assister le Coordonnateur de l'ONG dans la collecte des échantillons et des données botaniques et mycologiques sur le terrain ; Faire des enquêtes ethno biologiques auprès des populations locales ; Contribuer à l'établissement et au suivi des placeaux permanents dans les forêts du Nord Congo ; Gérer les échantillons botaniques et mycologiques au niveau de l'ONG.

Mai 2015- Janvier 2016 : Technicien. Initiative des Champignons et des Plantes du Congo (ICPC), Brazzaville, République du Congo. Responsabilités: Saisir les données botaniques et mycologiques des échantillons disponibles à l'ONG; Gérer les échantillons botaniques et mycologiques au niveau de l'ONG.

Filtrats de cendres des végétaux utilisés comme condiment naturel dans la cuisine congolaise: une solution pour la santé humaine

by

AWAH-LEKAKA Nelly Josiane^{1*}, MPIKA Joseph¹ & ATTIBAYEBA¹

KEYWORDS. — Alicaments; Diversité végétale; Eléments minéraux; Phytothérapie.

ABSTRACT. — Dans les traditions africaines, de nombreuses plantes sont utilisées pour la fabrication de sels végétaux. Porteres (1950) dénombre environ 150 plantes intervenant dans ce processus. Ces sels végétaux sont utilisés aussi bien en cuisine pour garder les légumes verts après cuisson (Awah-Lekaka *et al.* 2016) que pour le traitement de plusieurs maladies (Mianpeurem *et al.* 2012). Malheureusement, les populations des grandes agglomérations africaines ont tendance à négliger les sels issus des végétaux au profit du sel de cuisine (NaCl) qui est déconseillé aux personnes hypertendues, par exemple. Ainsi, dans le but de valoriser l'utilisation du sel végétal en République du Congo, cinq parties de trois plantes (les peaux des fruits et les hampes de bananes plantains (*Musa paradisiaca*); les régimes et les inflorescences mâles de palmier à huile (*Elaeis guineensis*) et les plants entiers de sésame (*Sesamum indicum*)) ont été utilisées pour l'extraction ce sel communément appelé "Moungoua ya ba sendzi". Ces différentes parties ont été séchées puis incinérées pour obtenir les cendres. Ces cendres sont ensuite dissoutes pour donner les filtrats. L'analyse élémentaire a été faite par spectrométrie de fluorescence X (SFX) et des tests de toxicité ont été menés sur des souris albinos femelles. Des activités antiparasitaires ont été évaluées sur les lombrics (*Lombricus terrestris*). Des tests antimicrobiens ont été réalisés sur 4 souches bactériennes et 5 souches fongiques. Les résultats indiquent que ces filtrats ont une concentration élevée en potassium (34,5%), plus faible en sodium (3,0 %) et des teneurs presque négligeables en métaux lourds (Awah-Lekaka 2018). Ils ont une DL₅₀ > 5000 mg/kg et sont donc considérés comme produit faiblement toxique. Ces filtrats peuvent être conseillés en diététique et être recommandés pour le traitement de l'hypertension artérielle (Mianpeurem *et al.* 2012). Les tests antiparasitaires indiquent que les lombrics mouraient par segmentation au contact du sel végétal à la concentration de 7,50 mg/ml en 45 min tandis qu'au contact du Mébendazole à la même concentration, la même réaction se produisait après 23 heures. Les tests antimicrobiens montrent que toutes les souches bactériennes et fongiques sont sensibles aux différents filtrats contrairement au témoin négatif.

Le fait que ce sel végétal intervienne dans le traitement de l'hypertension grâce à sa richesse en potassium, possède des vertus anthelminthiques et antimicrobiennes, cela ouvre une nouvelle voie dans la recherche des alicaments afin de valoriser son utilisation en Afrique.

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¹Faculté des Sciences et Techniques (Université Marien NGOUABI), Brazzaville, B.P. 69, République du Congo.

*Corresponding Author. Email: nellyawah@gmail.com

Nelly Awah-Lekaka

Diplômes obtenus

2018: Doctorat en Sciences Biologiques, Option: Biochimie et Microbiologie Appliquée, Université Marien Ngouabi, République du Congo.

2007: DEA en Immunologie du Paludisme, Option: Activités biologique et Biotechnologie, Université Marien Ngouabi, République du Congo.

2004: Master, Biologie Cellulaire et Moléculaire, Université Marien Ngouabi, République du Congo.

2002: Licence, Biologie Cellulaire et Physiologie, Université Marien Ngouabi, République du Congo.

Occupations professionnelles

2017- présent: Enseignante en Sciences Biologiques. Faculté des Sciences et Techniques, Université Marien Ngouabi, République du Congo.

2012-2017: Enseignante en Virologie et parasitologie, Ecole Paramédicale et Médico-sociale de Brazzaville, République du Congo

Insects: small animals with a major impact

by

CAPARROS MEGIDO Rudy* & FRANCIS Frédéric

KEYWORDS. — Entomology; Entomophagy; Edible insect; Insect pest and Insect vector.

ABSTRACT. — Generally, people consider insects as disease vectors, pests of fields and ornamental plants, depredators of stored products, and house and food contaminants. Nevertheless, they forget the beneficial impacts of insects such as pollination, seed dispersal, biological control, waste decomposition and as a potential source of human and animal proteins and lipids (Kellert 1993). Carried by the honeybee population decrease problematic, the loss of insect biodiversity gained more and more attention among scientists, politicians but also among the population. The latest alarm signal was sent by Hallman et al. (2017) who reported a 75 percent decline in total flying insect biomass in protected areas in Germany over 27 years. This loss of insect diversity and abundance is expected to provoke cascading effects on food webs and to jeopardize ecosystem services provided by insects. Moreover, a general loss of biodiversity in an environment could increase the negative impact of insects in an area. For example, vector-borne disease transmission could be reduced in high biodiversity area by what it is called the “dilution effect” (Vora 2008). In places with high biodiversity, vectors could feed on species that do not serve as hosts of the pathogen and then reduce disease transmission by breaking the pathogen cycle. Unfortunately, in poor biodiversity zones, vectors will feed more often on the pathogen host species and then increase the prevalence of this pathogen. Finally, insect could be considered as sentinels for following environmental health hazards in air, water, land and soil as they react really quickly to environmental disturbance and could help to target interventions in due to reduce exposures and improve ecosystem quality (Barrett and Osofsky 2013).

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Rudy M. Caparros

Professional experience

- **Lecturer, Agrobiochem Department of Gembloux Agro-Bio Tech ; 5030 Gembloux, Belgium. March 2018 - Actually.**

Insects and health: (1) The contribution of edible insects to human and animal food safety and security by promoting a diversity of organic residues according to local situations and (2) the impact of global environmental changes on blood-sucking insects that carry pathogens for humans or animals.

- **Post-Doc, Evolution, Vectors, Adaptation and Symbiosis laboratory, Montpellier Institute of Evolutionary Sciences ; 34000 Montpellier, France. March 2018 - Augustus 2018.**

Cytoplasmic incompatibility caused by *Wolbachia* symbionts in *Culex pipiens* mosquitoes

- **Assistant, Agrobiochem Department of Gembloux Agro-Bio Tech ; 5030 Gembloux, Belgium. October 2013 - February 2018.**

PhD thesis : Optimization of valuable insect mass-rearing for feed and food

Zoology practical training (1st Bachelor degree) : Zoology Organography and Entomology

Supervision of different PhD thesis (4 actually), master thesis and internship (22 actually)

- **Entomological Consulting, Agrobiochem Department of Gembloux Agro-Bio Tech ; 5030 Gembloux, Belgium. October 2013 - February 2018.**

Pest identification (Invertebrates), Bibliographic review, Proposal for treatment and Advices for preventative measures (Written report)

- **Administrator of the Jean Leclercq - Hexapoda Insectarium; 4300 Waremme, Belgium. December**

2012 - actually.

Helping during event organisation at the Insectarium.

- **Naturalist guide in entomology. September 2015 - actually**

Insect orders and families

- **Research Assistant, Functional and Progressive Entomology Unit ; 5030 Gembloux, Belgium. February 2011 - October 2013.**

Research project on the tomato leafminer, *Tuta absoluta*.

Research activities

(1) Edible insects in food and feed

(2) Biological pest control through understanding their chemical ecology

(3) Forensic entomology

(4) Relationships between the environment, endosymbiotes and mosquitoes

Een onderzoek naar de evolutie van waterkwaliteit in de regio Eala, Kisangani en Yangambi (DRC) doorheen de 20^{ste} eeuw - *Diatomeeën als bio-indicatoren*

door

MADDER Zoë¹ & COCQUYT Christine^{2*}

TREFWOORDEN. — Diatomeeën; Biomonitoring; Indices; Democratisch Republiek Congo; Herbarium; Waterkwaliteit.

SAMENVATTING. — Actuele factoren zoals klimaatverandering, lozing van afvalwater, overbemesting en overbevolking vormen een bedreiging voor de globale waterkwaliteit. Het verzekeren van een goede waterkwaliteit is dan ook één van de grootste uitdagingen van deze tijd. Monitoring en kwaliteitsbeoordeling zijn van fundamenteel belang om de gevolgen van menselijke activiteiten op aquatische ecosystemen te kwantificeren.

Diatomeeën kunnen een hoofdrol spelen in de ecologische waterbeoordeling. Deze microscopisch kleine eukaryotische kiezelwieren vormen één van de meest abundante en diverse algengroepen in de wereld. Het betreft autotrofe eencelligen, die worden getypeerd door hun extern kiezelskelet. Diatomeeën vormen een groot deel van de primaire producenten, waardoor zij aan de basis van alle aquatische voedselketens staan. Eveneens fungeren zij als goede bio-indicatoren voor waterkwaliteit. Dit omdat ze een representatief beeld van hun leefmilieu vormen. Elke diatomeeënsoort heeft namelijk een specifieke voorkeur voor een groot aantal milieuv variabelen, waardoor fysische en (bio)chemische veranderingen in hun leefmilieu zullen leiden tot veranderingen in de samenstelling van diatomeeëngemeenschappen.

In dit onderzoek, in de vorm van een bachelorproef, werden epifytische diatomeeëngemeenschappen bestudeerd om de waterkwaliteit van enkele waterlichamen uit Eala, Kisangani en Yangambi te bepalen. Dit zijn drie regio's uit de Democratisch Republiek Congo (DRC). Deze diatomeeën werden geïsoleerd van herbariumspecimens (*Nymphaea lotus* L. planten), die op verschillende jaartallen gedurende de 20ste eeuw werden ingezameld. In totaal werden er 12 stalen geselecteerd. Er werd nagegaan of de diatomeeëngemeenschappen geëvolueerd zijn doorheen de tijd en dus of er in deze regio's een evolutie in waterkwaliteit bestaat. Door microscopisch onderzoek werden de diatomeeëngemeenschappen bestudeerd en hun samenstelling werd in kaart gezet. Vervolgens werden via biodiversiteitsindices, auto-ecologische indices, een DCA en een clusteranalyse antwoorden geformuleerd op de onderzoeksvragen. In het algemeen bleek het water in de drie bestudeerde regio's van goede kwaliteit te zijn. In drie stalen werd echter een minder goede waterkwaliteit vastgesteld. Verder kon niet bepaald worden of de epifytische diatomeeëngemeenschappen geëvolueerd zijn doorheen de 20ste eeuw.

Het is belangrijk om op te merken dat dit onderzoek zich in een groter geheel kadert. Sinds de invoering van de Europese Kaderrichtlijn Water in 2000 zijn alle lidstaten verplicht om waterkwaliteitsanalyses uit te voeren aan de hand van verschillende biologische kwaliteitselementen zoals diatomeeën. Bijgevolg zijn in Europa een groot aantal diatomeeënindices voor de beoordeling van waterkwaliteit ontwikkeld. Indien gelijkaardige indices in Tropisch Afrika gebruikt kunnen worden, kan dit zeer voordelig zijn. Aangezien de middelen voor dure chemische waterkwaliteitsanalyses vaak ontbreken, is biomonitoring aan de hand van diatomeeën een goedkoop en betrouwbaar alternatief. Echter moet nagegaan worden in welke mate deze Europese indices geschikt zijn voor waterkwaliteitsbepalingen in Tropische regio's. Deze studie kan dus eventueel bijdragen aan een hoger doel, nl. het bepalen of Europees ontwikkelde indices representatief zijn in Tropisch Afrika.

¹Stagaire Plantentuin Meise, Nieuwelaan 38, B-1860 Meise, België

²Plantentuin Meise, Nieuwelaan 38, B-1860 Meise, België

*Corresponding Author. christine.cocquyt@plantentuinmeise.be

Zoë Madder

Opleidingen en diploma's

2019-heden: Schakelprogramma moleculaire en cellulaire biowetenschappen aan de Vrije Universiteit Brussel (VUB).

2016-2019: Bacheloropleiding agro- en biotechnologie, specialisatie biotechniek, Thomas More University of Applied Sciences, Campus Geel.

Bachelor thesis: Een onderzoek naar de evolutie van waterkwaliteit in de regio Eala, Kisangani en Yangambi (DRC) doorheen de 20^{ste} eeuw. *Diatomeeën als bio-indicatoren*. Promotoren: dr. Christine Cocquyt (Plantentuin Meise) en Rut Vleugels (Thomas More Geel).

Stage in de Plantentuin Meise van 11/03/2019 – tot 16/05/2019

Publicaties

Okito Mosindo A., Oleko R., Madder Z. & Christine Cocquyt. Epiphytic diatoms on herbarium material from the phytogeographic region VI of the Democratic Republic of the Congo. In prep. (will be submitted to Plant Ecology and Evolution)

Traditional healers' practices for collecting and identifying medicinal plants in the Lubumbashi region, Haut-Katanga, DR Congo

by

MUTOMBO SHAKALENGA Cedrick^{1,2*}, BAKARI AMURI Salvius¹, NACHTERGAEL Amandine²,
DUEZ Pierre² & KAHUMBA Byanga¹

KEYWORDS. — Identification; Collecting; Medicinal plant; Traditional Healers; Lubumbashi; DR Congo.

ABSTRACT. — Medicinal plants identification during harvesting is a key element for the safety of patients using phytotherapy (Williamson *et al.*, 2015; Yamani *et al.*, 2015). This study aims to understand what traditional healers do to identify medicinal plants, both those they collect and those that are harvested by other people. A survey was conducted in Lubumbashi, by semi-structured interview, among 114 traditional practitioners among whom 23 were legally recognized and 91 were identified by a snowball survey (Nzuki *et al.*, 2013). To identify plants to be harvested, most of the surveyed traditional healers observe morphology of whole plant (50%), shape, color and odor of leaves (40%) or roots (13%) and some other organoleptic elements. To differentiate similar species, most refer to odor (23%), color of leaves, roots or flowers. Traditional healers who sometimes use plants harvested by other people (30%) also refer to color (82%), odor (74%) or flavor, for identifying drugs. A large part of the surveyed traditional healers (48%) perform ceremonies during the harvest of medicinal plants. These ceremonies consist of depositing money or white kaolin at the foot of the plant, pronouncing incantatory words or being naked. The main reasons given for these ceremonies were to give the therapeutic power to the plant (62%) and/or buy it from nature (22%). Traditional healers mainly refer to morphological and organoleptic characteristics to identify plants and vegetables material they collect in the wild and those brought in by the harvesters. Reliability of these crude identification practices should be tested, especially for easy-to-confuse plants.

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¹Laboratory of Pharmacognosy, Faculty of Pharmaceutical Sciences, Université de Lubumbashi, Lubumbashi, RD Congo.

²Unit of Therapeutic Chemistry and Pharmacognosy, Faculty of Medicine and Pharmacy, University of Mons, 7000 Mons, Belgium

*Corresponding Author. Email: [*ShakalengaM@Unilu.ac.cd](mailto:ShakalengaM@Unilu.ac.cd) ;
Cedrick.MUTOMBOSHAKALENGA@student.umons.ac.be

Cedrick Mutombo Shakalenga

Pharmacist

Université de Lubumbashi – Laboratory of Pharmacognosy, Faculty of Pharmaceutical Sciences, 27 av. Kato, Commune Kampemba, Lubumbashi, DR Congo.

University of Mons – Unit of Therapeutic Chemistry and Pharmacognosy, Faculty of Medicine and Pharmacy, Bât 6, Chemin du Champ de Mars 25, 7000 Mons, Belgium.

Current occupations

- PhD student in cotutelle between the University of Lubumbashi and the University of Mons;
- Researcher in African Traditional Medicine;
- Supervisor of end-of-cycle work and end of studies dissertation;
- Teaching Assistant in the Department of Pharmacology at the Faculty of Pharmaceutical Sciences of the University of Lubumbashi.
- Member of the Good Practice in Traditional Chinese Medicine Research Association (GP-TCM RA)

Formation

- Since 2018, PhD training in cotutelle between the University of Lubumbashi (Unilu – RD Congo) and the University of Mons (Umons-Belgium), within the PhytoKat project (ARES – CCD);
- Pharmacist of Hospital and community option at Université de Lubumbashi (2016), Lubumbashi – DR Congo;
- Graduate in Pharmaceutical Sciences at Université de Lubumbashi (2013), Lubumbashi – DR Congo.

Applications of High-Performance Thin Layer Chromatography to the discrimination of morphotypes of *Vitex madiensis* subsp. *milanjiensis* and *Vitex mombassae* (Lamiaceae)

by

MUYUMBA NONGA Welcome^{1,3*}, GAUTHIER Marie-Lou³, BAKARI Amuri Salvius²,
 PALMIERI Claudio³, NGOY KIHUYA Edouard¹, LUMBU SIMBI Jean-Baptiste⁴, MEERTS Pierre⁵,
 NACHTERGAEL Amandine³ & DUEZ Pierre³

KEYWORDS. — High-performance thin-layer chromatography; HPTLC; *Vitex*; Morphotypes; leaflets.

ABSTRACT: — *Vitex madiensis* subsp. *milanjiensis* and *Vitex mombassae*, Lamiaceae family, are shrubs (MEERTS, 2018) whose leaves and roots are used in traditional medicine (DR Congo) to treat diabetes diarrhoea and malaria (BAKARI and al., 2017). The aim of this study was to characterize the chemical variability of the root barks of different morphotypes of these two medicinal plants.

High-performance thin-layer chromatography (HPTLC) allowed to profile and characterize root extracts obtained by percolation. The chemical profiles of ethyl acetate and methanol extracts indicated the presence of several phytochemical classes, compared to heptane and dichloromethane extracts, but with fewer discriminatory bands.

For both species, samples from the 2 investigated morphotypes showed similar profiles, but with some discriminatory bands in some extracts and HPTLC conditions; this indicates the possibility to differentiate the roots from both species and morphotypes. For the two *Vitex* species studied, morphotypes with 5 leaflets were easily discriminated from those with 3 and 5 leaflets.

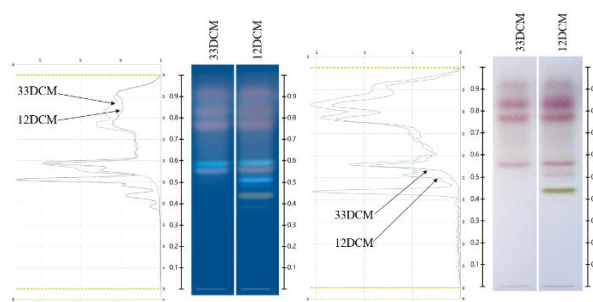


Figure 1: Chromatographic profiles detected (left) under UV₃₆₆ and (right) under daylight of heptane and DCM extracts of root bark of different morphotypes of *V. mombassae*; mobile phase: AcOEt-MeOH-H₂O (77:15: 8, v/v/v). Plates were treated with Vanillin-sulfuric acid reagent and heated 3 min at 110°C.

Legend: Root bark of *Vitex mombassae* 33 (3 and 5 leaflets) and 12 (5 leaflets).

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¹Department of Chemistry-physics, High college training teachers of Lubumbashi, Lubumbashi, 1825, DR Congo

²Laboratory of Pharmacognosy, University of Lubumbashi, Lubumbashi, 1825, DR Congo

³Unit of Therapeutic Chemistry and Pharmacognosy, Mons, University of Mons, 7000, Belgium

⁴Laboratory of Organic Chemistry, University of Lubumbashi, Lubumbashi, 1825, DR Congo

⁵Herbarium et bibliothèque de botanique africaine, Université Libre de Bruxelles, Brussels, 1050, Belgium

*Corresponding Author. Email: welcome.muyumbanonga@student.umons.ac.be

Welcome Muyumba Nonga

Welcome MUYUMBA NONGA is a Ph.D student at the University of Mons (UMONS) in Belgium at the Faculty of Medicine and Pharmacy, in the Department of Therapeutic Chemistry and Pharmacognosy.

His doctoral training began in 2017 and is based on the topic of chemical characterization of a genus of medicinal plants used in Katangan traditional medicine. This work was the object of more than 11 written and oral scientific communications and a paper (in preparation).

The chemical characterization in his research is based on the various chromatographic techniques, much more high performance thin-layer chromatography (HPTLC) using Camag instrumentation. At UMONS, HPTLC enabled him to develop methods for separating compounds from different extracts of the medicinal species he studies.

This pilot study confirms the high potential of HPTLC for quality control of medicinal plants. His studies can contribute to the development of an HPTLC atlas of the main medicinal plant species used in Katangan traditional medicine.

Caractérisation de la variation morphologique des espèces médicinales du genre *Vitex* (Lamiaceae) dans le Haut-Katanga (RD. Congo)

by

NSENGA Salvatora^{1*}, SHUTCHA Mylor¹, ILUNGA WA ILUNGA Edouard¹, AMURI BAKARI¹,
DUEZ Pierre³ & MEERTS Pierre²

MOTS-CLES. — Plantes médicinales; Identification; Variabilité morphologique; Morphotype; trichomes.

RESUME. — Les arbres et arbustes du genre *Vitex* (Lamiaceae) ont une grande importance médicinale en Afrique. En RD Congo 17 espèces sont connues (Meerts, 2018) dont plusieurs sont utilisées en médecine traditionnelle dans le Haut-Katanga (Bakari et al., 2017). En l'absence de fleurs, les espèces de ce genre peuvent être difficiles à distinguer par les différents acteurs de la filière des plantes médicinales. Cette situation pourrait être à l'origine de l'adultération des drogues commercialisées (Hounpke et al., 2016). Notre travail porte sur les différences de quatre espèces dans la Plaine de Lubumbashi, avec une attention particulière pour les critères micromorphologiques qui permettraient une identification des espèces sur base de petits fragments végétatifs.

L'étude a été effectuée à partir des échantillons en herbiers récoltés dans la région de Lubumbashi dans 200 placettes d'un hectare le long des axes routiers. Une collection d'herbiers témoins a été réalisée et déposée à l'herbarium de Lubumbashi. Les résultats ont permis de mettre en évidence une variation inter et intra spécifique entre les espèces étudiées en fonction des états de dégradation du paysage, et permet de soupçonner une variation des métabolites secondaires (chemotypes). Les caractères des trichomes (forme et dimensions des poils et des glandes de l'épiderme des feuilles) se révèlent intéressants pour identifier les espèces. Ils pourraient être utiles dans la lutte contre la falsification des drogues sur les marchés.

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¹Université de Lubumbashi, (UNILU), Lubumbashi, B.P. 1825, R.D. Congo. mylor.shutcha@gmail.com

²Université libre de Bruxelles CP 265, 15 Avenue F.D. Roosevelt 50, Bruxelles, B1050, Belgique. pmeerts@ulb.ac.be

³Université de Mons (UMONS). Bât.6, chemin du champ de Mars 25, Mons, 7000Mons, Belgique. pierre.duez@umons.ac.be

*Corresponding Author. Email: messinkulu@gmail.com

Salvatora Nsenga Nkulu

Profession actuelle

Chef des travaux à l'Université de Lubumbashi (UNILU) depuis 2019.
Doctorant à l'Université Libre de Bruxelles depuis 2017.

Etudes:

Université de Lubumbashi: Faculté des Sciences agronomiques

2017-2018 : Diplôme d'étude approfondies en sciences agronomiques : option Faune et Flore avec mention Grande Distinction.

2013-2014 : Deuxième grade : diplôme d'ingénieur phytotechnicien avec la mention distinction.
Matières étudiées : Ecologie appliquée, hydrologie, phytosociologie ...etc.

2012-2013 : Première grade, mention distinction.
Matières étudiées : biologie du sol, télédétection, phytotrophologie et fertilisation, phytotechnie spéciale, informatique et programmation ... etc.

2011-2012 : Troisième graduat en sciences agronomiques générales : mention satisfaction
Matières étudiées : biochimie, biométrie, chimie physique et analytique, mécanique de fluide et hydrologie générale... etc.

Stages -expériences et autres formations

- De 2009 à 2014 Stage de professionnalisation à la ferme Naviundu ;
- De 2011 à 2012 Stage de professionnalisation au jardin zoologique de Lubumbashi ;
- De 2013 à 2014 Stage de professionnalisation à la ferme Futuka ;
- De 2016 à 2018 Consultant en identification des espèces cupricoles, translocation et gestion de la biodiversité à l'entreprise SEK (Société d'Exploitation de Kipoï).
- De Janvier 2018 à Février 2018 Consultant en identification des espèces cupricoles.

Domestication des plantes médicinales du Haut-Katanga (R.D.Congo) : croissance en pépinière de quatre espèces du genre *Vitex* (Lamiaceae)

by

NUMBI MUJIKE Désiré^{1,3*}, SHUTCHA Mylor NGOY¹, ILUNGA WA ILUNGA Edouard¹, AMURI Bakari¹,
DUEZ Pierre² & MEERTS Pierre³

MOTS-CLÉS. — Culture; Domestication; Multiplication; Plantation; Matériel végétal.

ABSTRACT. — Au Haut-Katanga, des millions de personnes recourent à la médecine traditionnelle (MT) pour leurs soins de santé primaires (Bakari *et al.* 2017). Les plantes médicinales sont récoltées dans la nature et la demande pour ces matériaux ne cesse de croître, alors que leur disponibilité diminue à cause de la déforestation et de la surexploitation. Dans ce contexte, la domestication des plantes médicinales reste une piste envisageable pour un approvisionnement durable (Chen *et al.*, 2016). Cependant, la mise en culture peut se heurter à des multiples contraintes, notamment, le faible taux de germination, le manque d'enracinement et la mortalité en pépinières (Lewu *et al.*, 2018). C'est pourquoi, l'optimisation des techniques de propagation conditionne le succès de tout projet de domestication. Les études ethnobotaniques récentes ont démontré le rôle et l'importance des espèces du genre *Vitex* (Lamiaceae) en MT au Haut-Katanga (Okombe *et al.*, 2014). Cette étude, réalisée dans le cadre du projet PHYTOKAT, vise à optimiser les techniques de propagation pour améliorer la germination, l'enracinement, la croissance et le développement d'une sélection de PM, principalement du genre *Vitex*. Nos objectifs sont : 1) Obtenir une germination maximale ; 2) Obtenir l'enracinement de boutures. Le test de semis a été conduit en pots avec des fruits ayant subis différents traitements suivant un dispositif complètement randomisé, alors que les bouturages, de racines (sous châssis de propagation), de tiges (sous ombrière) et le marcottage ont été conduits en blocs complets randomisés. Les résultats obtenus à ce stade ont permis d'améliorer le taux de levée et d'obtenir l'enracinement de boutures. Les fruits verts déulpés trempés 24h dans l'eau puis scarifiés ont améliorés la germination de *Vitex mombassae* (66,6%). Le bouturage de racines convient mieux pour *Vitex doniana* (88%), alors que le bouturage de tiges juvéniles feuillées est plus efficace pour *Vitex fischeri* (60%). *Vitex madiensis* quant à lui s'est montré plus apte au marcottage (77,7%). Les expérimentations en cours permettront de déterminer l'effet de la saison de culture sur la reprise et le développement des plantes en pépinière puis au champ.

¹Université de Lubumbashi (UNILU), Lubumbashi, BP 1825, République Démocratique du Congo.

²Université de Mons, Bât.6, chemin du champ de Mars 25, B 7000 Mons, Belgique.

³Université Libre de Bruxelles, CP 265, Avenue F.D. Roosevelt 50, B 1050 Bruxelles, Belgique.

*Corresponding Author. Email: desire.mujike@gmail.com

Désiré Numbi Mujike

Université de Lubumbashi, Faculté des Sciences Agronomiques, Département de Gestion des Ressources Naturelles Renouvelables.

Formations

2017 : Etudiant en Thèse à l'Ecole Doctorale de l'Université Libre de Bruxelles.

Sujet de Thèse : Domestication et production en culture des plantes médicinales du Katanga.

2016: Diplôme de Master Recherche (Bac+7) en Agroforesterie et Optimisation des Services Ecosystémiques des Espaces Naturels et Cultivés du Bassin du Congo (AGROFOPSE-BC) à la Faculté d'Agronomie et des Sciences Agricoles (FASA) de l'Université de Dschang au Cameroun.

Titre du Mémoire: Influence des espèces agroforestières sur les performances du haricot (*Phaseolus vulgaris* L. (*Faboideae*) en culture en couloirs à Lubumbashi en République Démocratique du Congo: Cas de *Leucaena leucocephala* L. (*Mimosoideae*), *Cassia spectabilis* DC. (*Caesalpinioideae*) et *Acacia angustissima* M. (*Mimosoideae*).

2011: Diplôme d'**Ingénieur des Eaux et Forêts** (Bac+5) à la Faculté des Sciences Agronomiques de l'Université de Kinshasa (UNIKIN) / RDC.

Titre du mémoire d'Ingénieur : Etude de la gestion des Aires Protégées en République Démocratique du Congo : cas du Parc National de l'Upemba / Katanga / RD Congo.

2009 : Diplôme de Graduat en Sciences Agronomiques, UNIKIN / KINSHASA / RDC.

Titre du travail de fin de cycle : Gestion de la Réserve de Biosphère de Luki par le comité local de pilotage /Bas-Congo / RDC.

Medicinal plants and their use in forest-based interventions

by

POVILAITYTE-PETRI Vitalija^{1,3*}, KILPI Katriina^{2,3}, DUEZ Pierre¹ & NACHTERGAEL Amandine¹

KEYWORDS. — Medicinal plants; Forest therapy; Mental health; Health promotion; Migration.

ABSTRACT. — In our fast-moving and changing world, affected by climate change and migration, anxiety, chronic stress, burn-out or depression become epidemic. “Shinrin-yoku” (forest bathing), a traditional Japanese practice of immersing oneself in the atmosphere of the forest by mindfully using all senses, has expanded into mainland Asia and the Western world to become popular worldwide. This important inspiration for social and therapeutic nature-based interventions aims at reducing stress, enhancing human health and connecting people with nature, place and community. Forest bathing and therapy methods, now adapted to various cultural, social and geo-political contexts, may, depending on their cultural acceptability, prove useful for migrants from tropical regions who experienced many trauma in their difficult dis-connection from their environment and culture.

We analysed interlinkages between medicinal plants growing in Belgian urban and rural forests, the ecosystem services they provide and the use of medicinal plants in various forest-based health practices. Wild medicinal and edible plants, including medicinal trees, appear common in forests, rural and urban settings. The volatile organic compounds, "phytoncides", released from plants and trees, are proven to possess antimicrobial properties, decrease adrenaline levels, enhance human Natural Killer Cell activity and are considered important contributors to health outcomes. Medicinal plants are now considered to play an important role in forest therapy, providing various ecosystem services (e.g. provisioning, supporting or cultural). People attending forest bathing and forest therapy walks often forage medicinal and food plants. Besides stimulation of all senses that participants experience during forest therapy walks, people often also specifically explore medicinal plants by smelling, touching or testing them.

¹Unit of Therapeutic Chemistry and Pharmacognosy, Faculty of Medicine and Pharmacy, University of Mons, 25 Chemin du Champ de Mars, B-7000 Mons, Belgium.

²Department of Work Science, Business Economics and Environmental Psychology, Swedish University of Agricultural Sciences, SLU, Sweden.

³NatureMinded, Merelbeke, Belgium.

*Corresponding Author. Email: Vitalija.Povilaityte-Petri@hotmail.com

Vitalija Povilaityte-Petri

Dr. Vitalija Povilaityte-Petri (LT/BE) studies safe, sustainable and responsible use of medicinal and edible plants. She analyses how green spaces, therapeutic landscapes (urban gardens and forests) and traditional knowledge contribute to human connectedness with nature, to disease prevention and health promotion. She investigates what role biodiversity, city gardening, forest-based health practices, healthy nutrition, ethnobotanical knowledge and community involvement play in addressing societal, environmental and economic challenges.

Katriina Kilpi

Katriina Kilpi (FI/BE) conducts applied research on nature's effect on human wellbeing and advises various stakeholders on nature's health effects. She is an organizer of the International Forest Therapy Days and runs her NatureMinded Consultancy from Belgium. As a Forest Mind guide, she trains young and old to enjoy unhurried and mindful time in her beloved forests.

Pierre Duez

Prof. Pierre Duez (BE) is Director of the Unit of Therapeutic Chemistry and Pharmacognosy, Vice-Rector of International Relations and Mobility of the University of Mons, Member of the European Pharmacopoeia TCM working party, of the European Medicines Agency (Monograph and List Working Party), of the Belgian Commissions of Pharmacopoeia and Registration of Herbal Medicines.

Amandine Nachtergaele

Dr Amandine Nachtergaele (BE) is research and teaching associate in the Unit of Therapeutic Chemistry and Pharmacognosy (University of Mons).

Global community as knowledge building and sharing space in forest therapy methods developments and practical use

by

KILPI Katriina¹ & POVILAITYTE-PETRI Vitalija^{2*}

KEYWORDS. — Forest therapy; Nature connection; Global community; Health promotion.

ABSTRACT. — International Forest Therapy Days (IFTDays) is an initiative of global “bridge builders” from Europe, USA, Singapore, Japan, India, Korea, South Africa. They aim to, first and foremost, connect people with nature, place and community. IFTDays actions promote sustainable and pro-environmental behaviour, and address the issues of climate change, migration, biodiversity loss and nature conservation. The IFTDays brings together practitioners, scientists and policy makers working in forest therapy and related fields. The event provides time and space where professionals, using forest therapy in their daily work with a variety of client groups (refugees, over-stressed, burn-out, depressed people), can exchange knowledge and experiences. It aims to analyse and contribute to existing scientific knowledge and on-going research on health outcomes from forest, which could lead to policy developments in e.g. disease prevention and health promotion. The IFTDays also aims to evaluate methodologically the efficacy of forest bathing and forest therapy practices using questionnaires, surveys, semi-structured interviews and other health outcomes assessment tools.

IFTDays community has in its two years of operation managed to create a global, collaborative, transdisciplinary space for open dialogue and discussion with the main goal being nature connection. It aim to cover forest based health practices from the perspective of protection of intangible cultural heritage, promotion of sustainable tourism and ecopreneurship models. By creating a transdisciplinary sustainable and durable knowledge sharing space, IFTDays hopes to contribute in a collaborative way at the global scale to the development and validation of forest based therapy methods and sustainable forest management practices focusing strongly on cultural ecosystem services. On the grassroots level, the community members consisting of individuals, associations, organizations and companies, are also working on raising awareness of the general public, on forest therapy health outcomes, not the least of which is connecting people with nature. In the short term, through dialogue and inputs to the environmental, social and economic projects of local, regional, national or international organisations, IFTDays focuses on achieving the UN’s 2030 sustainable development goals.

¹Department of Work Science, Business Economics and Environmental Psychology, Swedish University of Agricultural Sciences, SLU, Sweden.

²Faculty of Medicine and Pharmacy, University of Mons, 25 Chemin du Champ de Mars, B-7000 Mons, Belgium.

*Corresponding Author. Email: Vitalija.Povilaityte-Petri@hotmail.com

Urban health gardens and ethnobotanical knowledge for city resilience

by

POVILAITYTE-PETRI Vitalija*

KEYWORDS. — Medicinal plants; Ethnobotanical knowledge; City resilience; Co-creation.

ABSTRACT. — The health of individuals and communities is one of the most essential and vulnerable points of the urban ecosystem and requires permanent efforts of individuals, communities and local institutions to ensure that the resilient city is functional in the face of climate change and other socio-economic challenges. Innoviris is the Brussels Institute for the encouragement of scientific research and innovation which is supporting Co-Create Actions encouraging citizens to set up research projects based on their questions, concerns and needs to ensure a resilient future for the city. Through the Co-Create actions, Innoviris wants to bring together the citizens of Brussels, academic researchers, associations and the world of business to build resilient systems.

The goal of the project “Health gardens in Brussels” is to study holistically urban health gardens as complex urban ecosystems which provide multiple benefits to human health. The health gardens are spaces for the exchange of traditional, local, bio-cultural and ethnobotanical knowledge and health practices. Brussels is a super diverse place which hosts more than 180 nationalities from different corners of the world including tropical countries. The information about Brussels citizens ethnobotanical and ethnopharmacological knowledge is very limited at the moment. No profound studies are available on the use of medicinal and edible plants in the daily lives, in self-care or even on medical prescriptions made by the doctors.

In this project the citizens-researchers will collect the knowledge of their own families and cultural heritage related to country of origin, they will describe the health practices related to medicinal plants, gardens, healthy food and daily practices that help to remain in good health.

The project is currently in its collaborative construction phase supported by Brussels Research Institute Innoviris. The study will assess how medicinal and food plants and urban gardens are being used to promote health by preventing illnesses. It will also investigate what social innovations could be offered by citizens-researchers, who are the main actors in this co-creation project in collaboration with academics, associations and local enterprises, in a crisis situation such as absence of medicines or unavailability of health services.

A guide on the "Healthy Garden" will be developed by the citizens-researchers and all project partners and will be made available to the inhabitants of the city of Brussels. The guide will cover design aspects of health gardens and their benefits for physical, mental, social and spiritual health.

*Museum of Medicinal Plants and Pharmacy, Faculty of Pharmacy, Université Libre de Bruxelles, Boulevard du Triomphe
CP : 205/9, B-1050 Brussels, Belgium.

*Corresponding Author. Email: Vitalija.Povilaityte-Petri@hotmail.com

Diversité de la faune des Isoptères de la forêt claire Miombo du Haut Katanga (R.D. Congo)

by

Freddy YUMBA NKULU*

KEYWORDS. — Termites; Diversity; Miombo; Abundance; Equidistribution.

ABSTRACT. — This study was initiated with the aim of contributing to the evaluation of the diversity of the Isoptera fauna of the Democratic Republic of Congo, case of the MIOMBO clear forest of the province of Haut Katanga. To do this, 4 villages were selected as sampling sites where a total of 1627 termites were collected by the method of Jones and Eggleton (2000) and identified by the determination key of BOUILLON & MATHOT (1965). A total of 27 species were identified divided into 27 genera and 3 families (*Termitidae* Holmgren, *Kalotermitidae* Enderlein and *Rhinotermitidae* Light) among which the family *Termitidae* Holmgren was the most represented with 22 species divided into 4 subfamilies: *Termitinae* Sjostedt, *Macrotermitinae* Kemner, *Amitermitinae* Kemner and *Nasutitermitinae* Hare. Of the identified species only 3 are common in the MIOMBO forest; they are *Acanthotermes acanthothorax* (Sjostedt), *Forficulitermes planifrons* (Emerson) and *Procryptotermes fryeri* (Holmgren). Calculated indices of diversity indicate that Isoptera are quite diverse because the Shannon H' index ranged from 3.99 to 4.47; Equal distribution of species by taxon in the sampling sites was almost the same with Pielou index values ranging from 0.92 to 0.95. The probability that 2 random individuals belong to different species is very large with values greater than 0.9 for all sites that are also similar with a JACCARD coefficient greater than 0.5.

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Freddy Yumba Nkulu

Enseignant et chercheur en écologie animale et gestion des ressources forestières.

Expérience

Chef de travaux à l'Institut supérieur pédagogique de Lubumbashi

De septembre 2016 à ce jour

Enseignant chargé de cours de systématique animale, microbiologie et génétique moléculaire

Assistant à l'Institut supérieur pédagogique de Lubumbashi

De septembre 2010 à septembre 2016

Enseignant chargé des travaux pratiques dans les cours de génétique moléculaire, systématique animale et microbiologie générale

Formation

2008-2009 : Diplôme de licence en pédagogie appliquée, option biologie à l'Institut supérieur pédagogique de Lubumbashi

2002-2003 : Diplôme d'Etat en pédagogie générale à l'Institut KILTULIZO de Lubumbashi (RD CONGO)

SESSION III

ONE HEALTH — ECOHEALTH — NATURE HEALTH BENEFITS

Application de l'Approche « One Health » dans un contexte socio-économique précaire

par

Justin MASUMU*

MOTS-CLÉS. — Santé ; One Health ; Précarité ; Contexte ; Socio-économie ; Collaboration.

RÉSUMÉ. — Entretenir 7 milliards d'individus dans un contexte de forte diversité et disparité des ressources naturelles reste un grand défi sur le plan mondial. Car, non seulement il faut trouver autant de ressources, toujours pas disponibles partout, pour assurer leur alimentation mais il faut en même temps leur garantir un espace vital pour leur bien-être et, surtout, savoir gérer les divers déchets de toute nature que eux ainsi que toutes les structures d'appui produisent chaque jour. Ainsi, si l'homme reste au centre de toutes les activités qui sont réalisées sur la terre, il va de soi que son avenir dépend largement des ressources naturelles qui sont mises à sa disposition. En effet, c'est la lutte pour l'accès à ces ressources naturelles qui est à la base de toutes les perturbations enregistrées actuellement dans tous les domaines ; tout dérèglement dans la gestion de ces ressources naturelles ne peut qu'être source des conséquences graves et irréversibles. De même, tout bénéfice généré dans un domaine peut engendrer d'énormes pertes dans un autre domaine. Actuellement, le domaine de la santé subit énormément de pressions qui découlent du développement d'autres domaines de la vie (tourisme, habitat, industrialisation, économie...). L'évolution de la modernité ainsi que la recherche du bien-être est souvent réalisée au détriment de la sécurité sanitaire des hommes, des animaux, des plantes ainsi que de leurs écosystèmes. De même, ces différents secteurs de la santé qui, du reste, sont intimement liés, interagissent entre eux. L'importance de cette interaction devient de plus en plus manifeste actuellement avec le développement technologique. Dans le domaine de la gestion du risque sanitaire à l'interface, il est actuellement reconnu que plus de 75% des maladies émergentes et ré-émergentes qui frappent l'homme sont d'origine zoonotique. De même, l'homme souffre tout autant de plusieurs affections qui dépendent directement de la santé environnementale et végétale. Dans un sens comme dans un autre, chaque acteur de l'écosystème (homme, animal, plante ou environnement) exerce une action qui peut être soit bénéfique soit néfaste vis-à-vis d'un autre secteur. Ainsi, de la nature de la gestion de ces différents acteurs ainsi que leurs interactions, dépendra finalement la qualité de la vie dont bénéficiera la planète. Si dans un contexte socio-économique favorable, la maîtrise des facteurs dont dépendent la santé humaine, animale, végétale et environnementale peut facilement être garantie, il n'en est pas le cas dans les régions où la vie socio-économique est précaire. Dans ces régions-ci, les inégalités entre les différents secteurs militent en faveur d'une forte collaboration qui, malheureusement, fait défaut suite à diverses causes en fonction des milieux. Non seulement il existe une très forte interaction entre ces différents secteurs dans le contexte où la vie socioéconomique est précaire, la limitation des ressources ainsi que le déficit de collaboration intersectorielle rendent très difficile la mise en place d'une véritable approche "One Health" dans ces milieux, pourtant considérée aujourd'hui comme une voie de sortie aux différents fléaux qui entravent le développement du potentiel sanitaire de ces différentes populations.

* Université Pédagogique Nationale Kinshasa & Université de Kinshasa (Democratic Republic of Congo)

*Corresponding Author. Email: jmasumu@hotmail.com

Justin Masumu

Justin Masumu est Professeur et Doyen à la Faculté de Médecine Vétérinaire de l'Université Pédagogique Nationale en République Démocratique du Congo. Il est aussi chercheur dans les deux laboratoires de référence de la RDC, l'Institut National de Recherche Biomédicale et le Laboratoire Vétérinaire Central, selon l'approche "One Health". Il dispense aussi des enseignements notamment sur les zoonoses émergentes et réémergentes ainsi que sur les stratégies d'intervention dans les urgences zoosanitaires à l'Ecole de Santé Publique de l'Université de Kinshasa dans un programme de maîtrise en Epidémiologie de terrain. En 2017, Il a créé le Centre Interdisciplinaire de Gestion du Risque Sanitaire (CIGERS) qui a eu, pour la première fois, le mérite d'évaluer le système de surveillance des maladies animales et des zoonoses en RDC. Depuis 2015, il coordonne un programme de formation du niveau de maîtrise sur le Renforcement des Compétences en Diagnostic, Epidémiologie et Socio-économie de la Santé Animale (RECODESSA), dont la coordination Nord est assuré par Professeur Nicolas Antoine-Moussiaux de l'Université de Liège. Depuis 2012, il fait partie de l'équipe de lutte contre la Maladie à virus Ebola où il coordonne les activités liées à l'aspect "Reservoir Animal". Vétérinaire tirant ses racines de l'Université de Lubumbashi depuis 1988, Justin Masumu a fait toutes ses études postuniversitaires en Belgique: la spécialisation et la maîtrise à l'Institut de Médecine Tropicale (IMT) d'Anvers de 2000 à 2002 et le PhD à l'Université de Ghent de 2003 à 2006. C'est à ce titre qu'il a pu décrocher le Prix ARSOM en Sciences Naturelles et Médicales en 2007 pour son travail intitulé "Molecular Epidemiology and Integrated Control of Bovine Trypanosomiasis in sub-Saharan Africa".

The necessity of a One Health perspective for managing urban primates

by

BROTCORNE Fany^{1*}, HUYNEN Marie-Claude¹, DELEUZE Stefan², ANTOINE-MOUSSIAUX Nicolas²,
WANDIA Nengah^{3*} & PONCIN Pascal⁴

KEYWORDS. — Primatology; Human-wildlife conflict; Macaque overpopulation; Zoonotic risk; Birth control.

ABSTRACT. — We live an epoch, the Anthropocene, of a major human-driven environmental change associated with a multiplication of contact zones where humans and wildlife interact and compete for resources. While most of the primate species experience population decline due to human activity, some more adaptive species can benefit and proliferate in anthropogenic environments. Primate overpopulation in cities correlates with multiplied conflicts with humans. The issue of urban primates has multilevel implications including harmful conflicts, threats for public health due to zoonotic risks, nuisance problems for people, and threats for primate survival, health and welfare. Given the interconnected implications between humans and primates in these shared ecosystems, a holistic and integrated approach for conservation, management and health care has become urgently needed during the recent decades. This pluridisciplinary approach roots in the One Health Initiative that seeks integration of biology, human and veterinary medicine, as well as social sciences to tackle such complex situations. Here, we aim at advocating the necessity to adopt a One Health perspective for research on urban primates, by illustrating it with our long-term research on Balinese macaques in Indonesia.

Bali provides a remarkable example of extensive human-macaque interface, with Monkey Forest tourist sites providing substantial economic value to local people. However, high macaque fecundity and low mortality driven by food provisioning and lack of natural predators have resulted in exponentially growing populations. Six years ago, questionnaire surveys with local people revealed that the cultural and economic values of macaques for Balinese Hindu communities promoted a substantial level of tolerance towards macaques. However, a more recent survey in 2019 revealed that negative attitudes and complaints are multiplying due to growing nuisances that overabundant macaques caused to human properties, crops, forest and people safety. We also noted an increase in bite and aggression frequencies towards humans, raising concern for public health, but also serious injuries amongst the macaques as a consequence of the sharp overpopulation-related social tension. This risk of zoonotic transmission is real as macaques are potential hosts of several zoonotic pathogens including the Simian foamy virus and Herpesvirus B. However, the risk for pathogen transmission is also bidirectional: over 15 years, we recorded two outbreaks due to *Streptococcus equi zooepidemicus* with a suspected livestock-related source, causing a significant mortality in macaques. Macaques are also subjected to frequent harassment and attacks from humans, raising concern for their welfare. This human-wildlife conflict has to be managed via a One Health perspective, by considering simultaneously the threats for primate population sustainability, public health implications, consequences of environment anthropization, and the cultural and economic dimensions for local communities. In several places in Asia, measures have been carried out to limit monkey overpopulation. In Bali, at the request of the local stakeholders and as an ethical alternative to culling and translocation, we are conducting since 2017 a sterilization program using female tubectomy. Outcomes of this program on population dynamics are monitored, as well as the potential side-effects on macaque behaviours and the outcomes in terms of conflict mitigation. Viral screening analysis are also planned to better assess and manage the zoonotic risks. This study case in Bali is a typical example of necessary collaborations among primatologists, veterinarians, social scientists and local stakeholders working together towards an integrative and holistic understanding of the best ways to manage urban primates in a sustainable basis for both primates and humans.

¹ Research Unit SPHERES – University of Liège, Liège, Quai Van Beneden, 22 - 4020, Belgium

² Research Unit FARAH - University of Liège, Liège - Ave de Cureghem 4000, Belgium

³ Faculty of Veterinary Medicine – Udayana University, Denpasar Bali, Kampus Universitas Udayana 80361, Indonesia

⁴ Research Unit FOCUS – University of Liège, Liège, Quai Van Beneden, 22 - 4020, Belgium

*Corresponding Author. Email: Fany Brotcorne (fbrotcorne@uliege.be)

Fany Brotcorne

Current position

Assistant Professor - University of Liège (Belgium)
Head of the Primatology Research Group (Uliège)

Research fields

Ethology, Primatology, Behavioural Ecology, Conservation, Population Control & Wildlife Management, Ethnoprimatology.

Work experience

2016-present : **Assistant Professor**

University of Liège – Behavioural Biology Unit: Lecturer and assistant of Prof P. Poncin, Dean of the Faculty of Sciences, ULiege, Liege, Belgium

Since 2017: Secretary of Belgian Group for Primatology and Group de Contact Primatologie (FNRS)

2015-2018 : Post-doctoral Fellow

University of Lethbridge (Canada), Behaviour and Evolution Research Group

PhD Fellowship

2014 : Grant from University of Liège, Liège (Belgium)

2009-2013: PhD Aspirant-FNRS fellowship from Belgian National Funds for Scientific Research
University of Liège - Behavioural Biology Unit - Primatology Research Group (Belgium)

Doctoral school: Biology of Organisms and Ecology

PhD dissertation title: *Behavioral ecology of commensal long-tailed macaques (Macaca fascicularis) populations in Bali, Indonesia: impact of anthropic factors.*

Fungal diversity contributing to a One Health policy, and vice versa

by

STUBBE Dirk^{1*}, PACKEU Ann¹, BECKER Pierre¹, D'HOOGE Elizabet¹, VAN DEN EYNDE Claudia² & HENDRICKX Marijke¹

KEYWORDS. — BCCM; Dermatophytes; Fusarium; Aspergillus; MALDI-TOF.

ABSTRACT. — Culture collections are an example of how biodiversity of micro-organisms can be preserved ex-situ. BCCM/IHEM is a culture collection of fungi related to human and animal health: pathogens, allergenic species, clinical isolates, and isolates from the human or animal environment. A culture collection represents more than species diversity, it is also genetic, geographical and historical diversity. This makes a culture collection an interesting resource for taxonomical or epidemiological studies, drug response experiments, etc. With the strains of the BCCM/IHEM collection, we were able to find support for the independent status of the otherwise debated dermatophyte *Trichophyton soudanense* (Packeu et al., accepted). Analysis of the *Aspergillus niger* complex and of the genus *Fusarium* showed species dependant antifungal resistance patterns. An accurate species identification is thus required for an adequate therapy (D'hooge et al., 2018; Triest et al., 2016). The collection was also the basis for the development of what is currently the largest MALDI-TOF reference database of clinical and veterinary isolates (Ranque et al., 2014). The database is now being used by hospitals for fast and cost efficient fungal identifications. To further improve the database, we continuously expand the diversity of the collection. We participated in a project on bat Lyssavirus (Van den Eynde, 2019). Bats sampled for blood, were also swabbed for fungi to check for *Pseudogymnoascus destructans*, a fungus causing mass mortality amongst American bat colonies. We did not find *P. destructans*, but retrieved over 200 unknown isolates that are probably new species for the collection.

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¹Sciensano, BCCM/IHEM, Brussels, Juliette Wytsmanstraat 14, Belgium.

²Ghent University, Faculty of Veterinary Medicine, Merelbeke, Salisburylaan 133, Belgium.

*Corresponding Author. Email: Dirk.Stubbe@sciensano.be

Dirk Stubbe

Scientist at Sciensano Curator of the BCCM/IHEM culture collection of fungi.	2010-present
PhD student at the Mycology Research Group, Ghent University Systematics and phylogeny of <i>Lactarius</i> subgenus <i>Plinthogalus</i> sensu lato	2006-2012
MSc in Biology At Ghent University	2003-2005
Assistant in Biology at K.U.L.A.K.	2003-2004
MSc in Bioscience Engineering: Agricultural Sciences At K.U.Leuven	1996-2001

Towards One Health management of Rabies in Bali: A preliminary socio-ecological approach to dog monitoring and management in Nusa Penida, Indonesia

by

THYS Séverine^{1*}, IKA Aria², WIDARTONO Barandi², GEDE PURNAMA Sang³, BOELAERT Marleen⁴,
ARTAMA Wayan² & DE GARINE-WICHATITSKY Michel^{5,6}

KEYWORDS. — Indonesia; Rabies; One Health; Dog movements; Socio-Ecology approach.

ABSTRACT. — Over the past years, the FAO-WHO-OIE tripartite initiative has published strategies for actions towards rabies elimination, and together with the Global Alliance for Rabies Control, they have set the global target of “zero human rabies deaths by 2030”. One Health features prominently as the conceptual framework for linking response across human and animal health organizations. Historically, biomedical approaches have dominated rabies research and interventions, as opposed to other disciplines such as socio-political-economic sciences and ecology. In Indonesia, where rabies remains endemic in 24 of the 33 provinces, a major knowledge gap limits the capacity of the stakeholders to attain elimination. Which features of the socio-cultural and bio-physical environment and which type of disease control measures implemented can explain why some provinces of Indonesia successfully eliminated rabies, whereas in others rabies is endemic and continues to spread to uninfected areas?

In line with the South-East Asian One Health movement, we initiated our research of zoonotic health problems in Indonesia within the context of their socio-ecological systems. Therefore, we first conducted an interdisciplinary exploratory study on the island of Nusa Penida (Bali Province), where rabies is successfully controlled, combining several qualitative (interviews and focus group discussions), participative (mind mapping) and quantitative methods (surveys, GPS tracking) in order to describe and understand the human-dog relationships within a socio-ecological approach. This pilot-study will present the complexity and importance of environmental and human-made parameters for explaining the spatial distribution of dog contacts, which will ultimately be instrumental in targeting the individual dog-owners likely to play the most critical role in the maintenance and spread of the disease.

¹Department of Veterinary Public Health and Food Safety, Faculty of Veterinary Medicine, Ghent University, Ghent, Salisburylaan 133, 9820 Merelbeke, Belgium.

²One Health Collaborative Center, Gadjah Mada University, Jalan Teknik Utara, Sleman, Yogyakarta 55281, Indonesia.

³Department of Public Health, Udayana University, Bali, Denpasar, Bali 80232, Indonesia.

⁴Department of Public Health, Institute of Tropical Medicine, Nationalestraat 155, 2000 Antwerp, Belgium.

⁵Faculty of Veterinary Medicine, Kasetsart University, 50 Paholyothin Road, 10900, Bangkok, Thailand.

⁶ASTRE, Université de Montpellier, CIRAD, INRA, Montpellier, France.

*Corresponding Author. Email: thysev@outlook.com

Séverine Thys

In 2004, Séverine Thys obtained a Master in Anthropology from the Université Libre of Brussels, and after some years working in the field of mental disablement, she was awarded a complementary multi-university master in Public Health, orientation Health and Development (ULB, ULg, UCL). From 2009 to 2018 she worked as an academic assistant at the Institute of Tropical Medicine (Antwerp, Belgium) (ITM), where she was involved in the study of perceptions of zoonotic diseases in rural communities: Echinococcosis in Morocco, Cysticercosis in Zambia, Rabies in South Africa and in Indonesia, and Human African Trypanosomiasis in Guinea. She was during 5 years the coordinator of a strategic network on Zoonoses and Neglected Diseases, generously supported by the Belgian Directorate-general for Development Cooperation and Humanitarian Aid , aiming at fostering intersectoral collaboration and to promote the concept of "One Health" among the institutional partners of ITM. She was a co-investigator in three FP7 EU projects (ICONZ, ADVANZ, NEXTGEN). In the early days of the Ebola Virus Disease epidemic in West Africa in 2014, she volunteered to be deployed in Guinea for the Global Outbreak and Alert Response Network (GOARN) of the World Health Organization. She started a Ph.D. at Ghent University, Faculty of Veterinary medicine, in 2014 on the “The added value of Anthropology for integrated control of Neglected Zoonotic Diseases in the One Health movement”, and obtained a scholarship from the Dubois-Brigué Foundation for an additional year of PhD research (2018) during which she was based at the Gadjah Mada Universitas in Yogyakarta, Indonesia, in the One Health/EcoHealth Collaborating Center.

Up to date, Séverine Thys has 15 international publications, of which five as the first author. She is also the author of a chapter in a book on “Framing Animals as Epidemic Villains” edited by Palgrave Macmillan (in press). As a speaker at several international congresses and as a lecturer on qualitative methodologies in several master programs in Belgium and abroad, she is continuing building bridges by launching a One Health Belgium Network together with representatives of different ministries, universities, and civil organizations.

Policy approaches for birds, bovines and farming

by

GRAY Aimee¹, McMAHON Barry J.^{1*} & KELLY Edel¹

KEYWORDS. — Conservation; Mowing policy; Whinchat; One Health.

ABSTRACT. — The evidence for birds supporting human health and well-being provides an encouraging basis for conservation. Whinchat *Saxicola rubetra* are ground nesting birds found across Europe whose survival rate is impacted negatively by agricultural practice and weather conditions. In Ireland, their breeding population is focused within a network of wet meadows, known as the Shannon Callows. Unpublished data collected at this location suggests that a reduction in the number of birds reaching the fledgling stage can be attributed to meadow mowing. Consequently, this paper focuses on exploring appropriate mowing policy.

Delayed mowing for whinchat is considered key to the species survival however, well-intended scientific based conservation measures that put restrictions on human activities often ignore the dynamics of nature. For example, delayed mowing implemented for the corncrake *Crex crex* could not protect the species from summer flooding resulting in its extirpation from the callows, a significant fodder shortage for cattle and economic losses for farmers. This highlights that timing for nature and farming is triggered by ecological cues, not calendar dates. If we are to ensure agriculture and conservation work together, more pragmatic holistic approaches to conservation are required. Human, animal and ecological interests must be incorporated in whinchat conservation design by:

1. studying whinchat breeding phenology and habitat requirements
2. meaningful farmer engagement to optimise their interests.

Increasing understanding of these facets will encourage socio-ecological system based conservation that is more in line with the One Health paradigm.

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¹University College Dublin, School of Agriculture and Food Science, Agriculture and Food Science, Belfield, Dublin 4

*Corresponding Author. Email: barry.mcmahon@ucd.ie

Aimée Gray

Aimée Gray is a current PhD Candidate funded by the Irish Research Council (IRC). After completing an undergraduate degree in geography in 2013, primarily focusing on human geography, she went on to study a MSc Wildlife Conservation at University College Dublin. Her combined interests in the social and natural sciences contributed to the design of her current PhD project. The project is under the arch of wildlife conservation where the focus is on conserving the red-listed Whinchat *Saxicola rubetra*. The project approaches the conservation of this farmland bird through the acceptance that agricultural landscapes are complex socio-ecological systems where humans, animals and the environment interact on a daily basis. Hence, optimising the interests of the ecological environment requires a balance with the social environment. Overall, Aimée hopes to make a valid contribution to species conservation and the design of conservation projects.

Conservation conflict following a management shift in Pendjari National Park (Benin): a Q methodological study

by

JANSSENS Iliana^{1*}, Jean HUGÉ¹ & Farid DAHDOUH-GUEBAS¹

KEYWORDS. — Africa; Biosphere Reserves; Stakeholder perception; Biodiversity conservation; Conflict resolution.

ABSTRACT. — With biodiversity drastically declining on a global scale, the conservation of natural resources is becoming increasingly urgent. A common strategy to counteract biodiversity loss is the sustainable management of protected areas. However, as the protection of nature often conflicts with human livelihoods and involves many stakeholders with different interests, conservation conflict is globally on the rise. These conflicts can hamper sustainable development, social equity and the effective natural resource management. An important first step in resolving conflict is understanding and mapping perceptions of the different stakeholders. In this study, we investigated conservation conflict in the Pendjari National Park in Benin, which was fueled by a shift from participatory management to a Public-Private Partnership. Pendjari is the largest remaining savannah ecosystem in West Africa and home to several threatened megafauna species. Using the Q-methodology, we identified two distinct discourses among stakeholders. The first discourse, supported mainly by formally educated people with non-agricultural jobs, focuses on the limitation of anthropogenic activities in favor of biodiversity conservation. The second discourse is mostly supported by people with a lower education level and a direct dependency on the land. They agree there is a need for conservation but even more so for viable alternatives to the people's current livelihoods. We identified the potential underlying factors that may have driven the conflict and suggest possible solutions. The identification of these discourses and their underlying drivers can be included into future decision-making processes and management of the Pendjari National Park.

¹Vrije Universiteit Brussel, 1050 Brussels, Pleinlaan 2, Belgium

*Corresponding Author. Email: janssens.iliana@gmail.com

Iliana Janssens

Education

2017- 2019

MSc of Biology: Human Ecology (*Graduation 9/9/19*) VUB Brussels

MSC Thesis on biodiversity conservation in West Africa

2014 - 2017

BSc of Biology *Graduated with 83% (magna cum laude)* VUB Brussels

BSc Thesis on ecology and genetic conservation of mustelids

Grade: 90% (summa cum laude)

Experience

Aug '19-Feb '20

Internship at Policy & Business Department, WWF Belgium

Literature review on cacao deforestation

Lobbying in “Beyond Chocolate”-project and other multi-stakeholder contexts

April-May '19

Internship at “Capacities for Biodiversity and Sustainable Development”, RBINS

Co-writing UNESCO manual on ecosystem service management

Aug-Oct '18

Tropical fieldwork Master Thesis, VUB Brussels

“Conservation conflict in Pendjari Biosphere Reserve, Benin”

Q methodology and Rapid Ecosystem Service Assessment tools (TESSA, NGT)

Presentation preliminary results on scientific congress in Natitengo, Benin

Aug '15

Volunteer for tropical fieldwork, Mexico

Bat ecology, sampling of tropical underwater cave systems (*see picture*)

Factors associated with the westwards spread of the cholera epidemic in the Democratic Republic of the Congo: a pilot study

by

KAYEMBE NTUMBA Harry-César^{1*}, BOMPANGUE Didier¹, SITUAKIBANZA Hippolyte¹
& OZER Pierre²

KEYWORDS. — Westward spread; El Niño; Armed conflicts.

ABSTRACT. — Cholera is an acute diarrheal disease caused by the Gram-Negative Bacterium *Vibrio cholerae*. This disease still affects at least 47 countries across the world, resulting in an estimated 2.9 million cases and 95,000 deaths per year worldwide (Ali *et al.*, 2015). The Democratic Republic of the Congo (DRC), one of the most affected countries in the world, accounts for nearly 7% of the cases and 4% of the population at risk worldwide (Ali *et al.*, 2015). The eastern DRC, where cholera's hotspots are located, reports outbreaks annually, while the remaining part of the DRC is sporadically affected (Bompangue *et al.*, 2012). The present study aims to analyze the factors associated with the westwards spread of cholera in the DRC. We hypothesized that environmental (armed conflicts in the east), climatic (El Niño years) and human (population movements) factors are the main predictors. Cholera notification data from the Ministry of Public Health were collected at a weekly time scale from 2000 through 2017. The data on armed conflicts (2000-2017) and numbers of internally displaced persons (2009-2017) were extracted from following databases: <http://www.acleddata.com/data/> and <http://www.ehtools.org/data/>, respectively. Using binomial regression models, El Niño events [Odds Ratio (OR) 3.3, 95% confidence interval (CI) 1.86-5.93] and armed conflicts in the east (OR: 1.07, 95% CI: 1.05-1.09) were associated with the westwards spread of cholera out of eastern endemic provinces.

Our findings imply that we may be able to provide epidemiological tools to forecast the spread of cholera epidemics in the DRC. In operational terms, they could enable the implementation of public health preventive measures because El Niño events are predictable 6 to 12 months in advance.

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¹University of Kinshasa, B.P. 834 Kin XI, Kinshasa, Democratic Republic of the Congo.

²University of Liège, 4000 Liège, Belgium.

*Corresponding author's e-mail: harry.kayembe@unikin.ac.cd

Harry-César Kayembe Ntumba

Academic and professional levels: M.D., M.Sc., Ph.D. student

Institution: University of Kinshasa

Postal address: Faculté de Médecine, Université de Kinshasa, B.P.: 834 Kinshasa XI, Democratic Republic of the Congo

Impact du sous développement sur la biodiversité des pays du sud: cas de la RD. Congo

by

NYEMBO Faustin^{1*}, MUANZA Alice¹ & KATENDA Jean Marcel²

KEYWORDS. — Monitoring; Politique agricole; Biodiversité; Poisson; Charbon de bois.

ABSTRACT. — La biodiversité de la province du Kasai Oriental est longtemps resté méconnue du monde scientifique (Kalambaie et al, 2015). Ainsi, deux intéressants projets de recherche sur l'identification et la mise en place des indicateurs de la biodiversité dans les secteurs de la pêche et de charbon de bois ont été conduits par des jeunes chercheurs de l'Université Officielle de Mbuji-Mayi en RD. Congo appuyé par l'IRSNB par le truchement du programme CEBIOS. Les résultats montrent que les politiques agricoles appliquées dans les pays du sud sont inquiétants en ce qui concerne l'avenir de la biodiversité dans le continent africain. Ces études témoignent que les activités exercées dans n'importe quel secteur en RD. Congo constituent des menaces directes sur la biodiversité.

Le rapport de l'étude sur l'évaluation de la production de Charbon de bois montre que faute d'électrification des villes africaines, des espèces d'arbres sont entrain de disparaître. A cause des activités de carbonisation et de l'agriculture sur brûlis. Le nombre d'espèces utilisées dans la fabrication de charbon de bois sont de moins à moins élevé et varie d'une région à une autre (Kavumbu et al, 2017).

Le second rapport sur l'étude d'évaluation de la diversité des espèces de poissons pêchés à Tshala, montre également que par manque d'une politique alignée sur les différentes conventions sur la biodiversité, certaines espèces de poissons ont disparues des eaux de la RD. Congo (Akongwa et al, 2017) malgré les avertissements de la communauté internationale.

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¹Université Officielle de Mbuji-Mayi, Mbuji-Mayi, 2105 Mbuji-Mayi 1, République Démocratique du Congo.

²Synergie des Compétences pour la Réussite Intégrale du Développement Agricole, Mbuji-Mayi, 35 Mbuji-Mayi 1, République Démocratique du Congo.

*Corresponding Author. Email: nyembokab@gmail.com

Alice Muanza Kapuadi

Alice Muanza Kapuadi est ingénieur agronome en phytotechnie ; enseignante- chercheuse à la Faculté des Sciences Agronomiques de l'Université Officielle de Mbujimayi en RD. Congo. Elle a une maîtrise en gestion de la biodiversité et à travailler dans la modélisation du bilan carbone des systèmes agro forestier à l'Université de Kisangani en RD. Congo. Chercheuse pour la mise en œuvre du processus d'accès au ressource génétique et partage juste équitable des avantages issus de leurs utilisations (APA) en RDC. Chercheur principal du projet MRV sur le charbon de bois au Kasai Oriental. Inspectrice semencier au service national de semence de l'inspection provincial de l'agriculture du Kasai Oriental.

Faustin Nyembo Kabemba

Faustin Nyembo Kabemba est enseignant chercheur à la Faculté des Sciences Agronomiques de l'Université Officielle de Mbujimayi, Province de Kasai Oriental, RD. Congo, spécialiste en gestion de biodiversité et changement climatique ; responsable du projet Monitoring Reporting et Verification 'MRV' 2019-2021 basé sur l'établissement des indicateurs des menaces sur la biodiversité, Thématique « pêche durable » présentation sur l'identification des espèces halieutiques locales commercialisées sur les marchés de Mbujimayi ; Chercheur à l'école doctorale du Centre d'excellence africaine sur la biodiversité, agriculture durable et changement climatique de l'Université Félix Houphout Boigny. Président de la SCRID Agri/asbl.

Integrating geospatial technologies and crowdsourcing to map communities for health planning in Southeast Bangladesh

by

QUADER Mohammad Abdul^{1*} & ZAMAN Sazid Ibna²

KEYWORDS. — Bangladesh; Satellite image; Mapping; Community.

ABSTRACT. — Most countries lack current and complete data on the locations, boundaries, names and populations of communities since traditional methods of data collection are time consuming and costly. This can severely constrain disease surveillance, disaster relief and delivery of essential services including healthcare, nutrition, electricity and water. It can thus be a major threat to public health and a substantial barrier to achieving sustainable development goals. Bangladesh is typical of developing countries with this being particularly problematic in rural and remote areas. A simple, rapid and low-cost method was developed and applied by a team of volunteers and researchers to map communities in southeast Bangladesh by annotation of satellite images, participatory mapping and field GPS data collection. The results were compared to the existing government village registry, and used to estimate population and measure distances to health facilities. 70 volunteers mapped polygon boundaries of communities (clusters of buildings comprising camps, nucleated hamlets, villages or towns) and point locations of dispersed settlements (single homesteads and farmstead settlements) in southeast Bangladesh using Google Earth. Over four months, the team iteratively developed methods and mapped an area of 3,394 km² with annotation of 2,733 polygons and 11,795 point locations in Phase 1. The mapped area comprised 41 grid rectangles. The average time to annotate and validate a grid rectangle was nine hours. Validation was against GPS coordinates of villages collected from satellite images in workshops with local government and NGO staff, plus field visits. Collecting the names of the mapped communities through crowdsourcing proved to be more challenging and efforts to develop methods for this are ongoing as well. The results have immediate utility for the government for disease surveillance and health service provision and this work was done in partnership with the National Malaria Elimination Programme, Directorate General of Health Services for this purpose. Distances between the communities and health facility can help the government to make appropriate plans to provide healthcare facilities and services to people who live in malaria endemic areas. Furthermore, we have estimated population size by counting households within the polygon and multiplying the counts with average household size that will help to allocate proper resources e.g. distributing bed nets in communities. Ultimately, program can easily identify the hotspots at community level by combining the results with disease data that will help to apply appropriate interventions e.g. IRS (Indoor Residual Survey) in and around the hotspots area towards control and elimination of malaria.

¹Associate Professor, Department of Geography and Environment, Jagannath University, Dhaka-1100, Bangladesh.

²GIS Specialist and Data manager for Malaria epidemiology, Mahidol Oxford Tropical Medicine Research Unit (MORU), Dhaka, Bangladesh.

*Corresponding Author. Email: mquader@vub.be

Mohammad Abdul Quader

Mohammad Abdul Quader received B. Sc. Honors and M.S. in “Geography and Environment” from Dhaka University in 2006 and 2008 respectively. Later he has completed his second M.S. in Physical Land Resource Engineering in Ghent University and VUB, Belgium in 2013. Mr. Quader is an Associate Professor in the department of Geography and Environment, Jagannath University, Bangladesh. He is now working under VLIR-UOS funded ICP PhD project on ‘Climate Change Related Risk and Adaptation Strategies in Coastal Area of Bangladesh’ under supervision of Professor Matthieu Kervyn.

Mr. Quader is working on coastal environment of Bangladesh. During his master’s thesis in Bangladesh he looked into the spatio-temporal distribution and management of cyclone shelters in the coast of Bangladesh. Later he studied the evolution of mangrove forest of south western coast of Bangladesh by using remote sensing techniques as part of his master’s thesis in Physical Land Resource. He published more than ten articles in peer-reviewed journals among which two are published on A1 journals. His current research interest is in natural hazard and disaster management in context of climate change by using geo-spatial techniques. Extensive field work for focus group discussion (FGD), household questionnaire survey, key informant interview (KII) in coastal environment is part of his work.

Sazid Ibna Zaman

I am currently working as a GIS Specialist and Data manager for Malaria epidemiology at Mahidol Oxford Tropical Medicine Research Unit (MORU). I am also a co-founder of GroupMappers based in Bangladesh, a citizen science initiative. I have over 12 years of experience in data management and Geographic Information Systems (GIS) mapping in Bangladesh. This work has been for national and international organizations both within the country and abroad like Denmark, Thailand. I provide technical support relating to the standardization, collection, sharing and analysis of geospatial data and the efficient use of geography and GIS technology for decision making. My research aims to identify the spatial distribution of malaria in terms of both the host human and mosquitoes in Bangladesh over space and time and investigate the determinants of the changing pattern of the spatial distribution of malaria to inform planning of strategies for malaria control and elimination. I am focusing on the core components of malaria epidemiology group include clinical and epidemiological field studies, collation of data from a wide range of partners, GIS mapping, spatial statistical analysis and modelling, as well as building capacity in epidemiology and mapping across the region. My research interests include malaria elimination, spatiotemporal epidemiology, GIS mapping and analysis, vector behavior, disease forecasting, environmental modelling, population movement.

Dynamique de l'occupation du sol autour des sites miniers le long du gradient urbain-rural de la ville de Lubumbashi, RD Congo

by

USENI SIKUZANI Yannick^{1*}, MALAISSE François², HALLEUX Jean-Marie³,
MUNYEMBA KANKUMBI François¹ & BOGAERT Jan¹

KEYWORDS. — Sites miniers; Anthropisation; Indices de structure spatiale; Télédétection/SIG; Gradient urbain-rural.

ABSTRACT. — À Lubumbashi, la croissance spatiale urbaine rapide (880ha/an par an ; Useni et al., 2018) et non planifiée concourt à des changements importants de l'occupation du sol, en particulier autour des sites miniers où de fortes concentrations de métaux lourds dans les sols présentent des risques environnementaux et sanitaires (Banza et al., 2009). La présente étude vise à évaluer le processus d'anthropisation des paysages autour des sites miniers de la ville de Lubumbashi de 1989 à 2014. Les tendances évolutives de l'occupation du sol ont été quantifiées à travers l'aire de taches dans des bandes comprises entre 0-500m, 1000-1500m, et 2000-2500m des sites miniers. Les résultats obtenus ont montré que la périphérie des sites miniers a enregistré une expansion rapide du bâti, suivie d'une régression des sols nus et de la végétation, essentiellement après 2002. Cet effet est nettement plus marqué autour des sites miniers urbains. Ces perturbations qui sont dues à la croissance démographique rapide, s'amplifient avec le temps et sont perceptibles au sein de toutes les classes de distance aux sites miniers. La pénurie de l'offre foncière constructible a poussé certains ménages à s'installer sur les terrains vides situés à proximité des sites miniers où les actions anthropiques ont contribué à disperser les polluants métalliques (Vranken et al., 2013), dont la présence se révèle par l'absence de végétation, ou la présence d'espèces de la flore cupricole (Munyemba et al., 2008). L'urbanisation autour des sites miniers pourrait amplifier la dégradation environnementale et l'exposition humaine aux métaux lourds.

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¹Unité Ecologie, Restauration Ecologique et Paysage, Faculté des Sciences Agronomiques, Université de Lubumbashi, Lubumbashi, 1825, RD Congo.

²Biodiversité et Paysage, Gembloux Agro-BioTech, Université de Liège, 5030, Gembloux, Belgique

³Institut de Géographie Economique, Université de Liège, 4000, Liège, Belgique

*Corresponding Author. Email: SikuzaniU@unilu.ac.cd; yannickuseni@gmail.com

Yannick Useni Sikuzani

Professeur Associé, Unité Ecologie, Restauration Ecologique et Paysage ; Département de gestion des ressources naturelles renouvelables, Faculté des Sciences Agronomiques, Université de Lubumbashi (R.D. Congo).

Etudes

2014 - 12 Juillet 2017 : Diplôme de docteur en Sciences agronomiques, option gestion des écosystèmes (Université de Lubumbashi & Université de Liège Gembloux Agro-BioTech). PRD « Création d'un Centre de compétences en planification et gestion urbaine à l'Université de Lubumbashi » (ARES-CCD, Belgique). Titre de la thèse : Analyse spatio-temporelle des dynamiques d'anthropisation paysagère le long du gradient urbain-rural à Lubumbashi (Haut-Katanga, RD Congo).

2012-2013 : Diplôme de master complémentaire en planification et gestion urbaine (Option : Ecologie urbaine et du paysage). PRD « Création d'un Centre de compétences en planification et gestion urbaine à l'Université de Lubumbashi » (ARES-CCD, Belgique). Titre du mémoire : Interprétation paysagère du processus d'urbanisation à Lubumbashi : structure spatiale, approche diachronique et indicateurs écologiques.

2007-2009 : Diplôme d'Ingénieur agronome, Département de phytotechnie, Faculté des Sciences Agronomiques, Université de Lubumbashi (R.D. Congo). Titre du mémoire de fin d'étude : Transfert des éléments traces métalliques dans le système sol-plante et évaluation des risques de contamination de la chaîne alimentaire. Etude des cas dans la ville de Lubumbashi.

2004-2007 : Diplôme de Gradué en Sciences Agronomiques, Faculté des Sciences Agronomiques, Université de Lubumbashi (R.D. Congo). Titre du travail de fin de cycle : Impact de la structure des recettes et des dépenses sur la sécurité alimentaire des ménages agricoles de l'hinterland minier de la ville de Lubumbashi (Village Kawama).

Expérience de recherche (travail)

10 Novembre 2018 : Vice-Doyen chargé de l'enseignement à la faculté d'architecture de l'Université de Lubumbashi (Décision rectorale n° 212/2018).

22 Septembre 2018 : Membre de l'équipe chargée de la mise en œuvre et le démarrage de la faculté d'Architecture de l'Université de Lubumbashi (Décision rectorale n° 174/2018).

07 Août 2018: Professeur Associé à l'Université de Lubumbashi (Décision ministériel 306/MINESU/CAB.MIN/SMM/JPK/MKK/2018).

12 Juillet 2017: Docteur en Sciences Agronomiques (Université de Lubumbashi et Université de Liège Gembloux Agro-Biotech).

27 Novembre 2017: Chef de travaux à l'Université de Lubumbashi (Décision ministériel 165/MINESU/CAB.MIN/TMF/RK3/CPM/2015).

25 Septembre 2010: Assistant d'enseignement à l'Université de Lubumbashi (Décision rectorale numéro 215/2010).

Plusieurs consultances, dont au Bureau d'étude et de recherche sur l'environnement au Congo, BERCECO Sarl (depuis 2014), la Word Vision (Avril 2014) et la société Tenke Fungurume Mining (2012-2014).

Mes enseignements, recherches et publications sont axés principalement sur l'analyse qualitative et quantitative de l'anthropisation des paysages, l'aménagement du paysage, l'écologie urbaine, la gestion des ressources naturelles renouvelables, la télédétection, les systèmes d'information géographique et la cartographie, l'analyse des services écosystémiques, la périurbanisation et la dynamique des populations végétales (y compris les espèces invasives).