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THE CEBIOS PROGRAM AND ACTIVITIES RELATED TO HEALTHY ECOSYSTEMS, THE ONE HEALTH CONCEPT AND ZOOZOSES



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museum 

By Luc Janssens de Bisthoven (coordination CEBioS), Hilde Keunen (programme officer CEBioS), Erik Verheyen (researcher at Royal Belgian Institute for Natural Sciences) & Marie-Lucie Susini Ondafe (programme officer CEBioS, Global Taxonomy Initiative)

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One Health concept and zoonoses
April- 2020
Overview for DGD (MD8)

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1-Introduction

This overview answers a demand by MD8 of DGD in April 2020, on how CEBioS and related partners at the Royal Belgian Institute for Natural Sciences are promoting research and awareness on healthy ecosystems, the One Health concept and research and awareness on zoonoses in the global South. The demand was formulated during the Corona virus crisis and on-going debates in international organisations devoted to development and conservation (e.g. UNEP).

For more information about the general program, see the CEBioS web site <http://www.biodiv.be/cebios2/>.

2-One Health (related) publications with CEBioS staff

- Janssens de Bisthoven, L. (2016). La biodiversité dans le Sud a plus que jamais besoin de protection. GLO.Be, 2016
- Antoine-Moussiaux, N., Janssens de Bisthoven, L., Leyens, S. et al. (2019). The good, the bad and the ugly: framing debates on nature in a One Health community. Sustain Sci 14, 1729–1738 (2019). <https://doi.org/10.1007/s11625-019-00674-z>
- (several in preparation)

3-Stop wildlife trafficking, July 2018

- EU Exhibition: <http://www.biodiv.be/cebios2/news/wildlife-trafficking-exhibition>. At the European parliament. CEBioS participated with a video booth and with the conceptualisation of the exhibition.

4-Publications by CEBioS' supported grantees from partner countries in the subprogram 'Global Taxonomy Initiative' (GTI)

The GTI subprogram of CEBioS supports young researchers in the South for their taxonomic research. GTI grantees spend one month with an expert in Belgium (mostly at RBINS) with a short term scholarship, or RBINS researchers do capacity building in the South with GTI funding. As proposed by DGD, we selected the publications related to environmental health/ livelihoods in general, as the GTI is not focusing specifically on one thematic only. Improved livelihoods and pest management will mitigate biodiversity degradation like poaching, bushmeat traffic and markets and deforestation, and hence contribute to decrease the risks of pandemics.

Pest management, food security, invasive species:

Billah M. K., Agbessenou A., Wilson D. D., Dekoninck W. and Vangestel C. (2017) Morphometric Studies of the Sweet Potato Weevil, *Cylas* Species-Complex in Southern Ghana. Science and Development. Volume 1, No. 2, 2-18.

Coulibaly, T., Akpessa, A.A.M., Boga, JP. et al. J Insect Conserv (2016) Change in termite communities along a chronosequence of mango tree orchards in the north of Côte d'Ivoire, Journal of Insect Conservation doi:10.1007/s10841-016-9935-1

Coulibaly T., Akpessa Akpa A. M., Yapi A., Zirihi Guédé N. and Kouassi Kouassi P. (2014) Dégâts des termites dans les pépinières de manguiers du nord de la Côte d'Ivoire (Korhogo) et essai de lutte par utilisation d'extraits aqueux de plantes. Journal of Animal & Plant Sciences, 22(3): 3455-3468.

Kouakou L.M.M., Dekoninck W., Kone M., Delsinne T., Yeo K., Ouattara K. & Konate S. (2018). Diversity and distribution of introduced and potentially invasive ant species from the three main ecoregions of Côte d'Ivoire (West Africa). Belgian Journal of Zoology 148 (1): 83–103. <https://doi.org/10.26496/bjz.2018.19>

Kouakou L.M.M., Yeo K., Ouattara K., Dekoninck W., Delsinne T., Konate S. (2018) Investigating urban ant community (Hymenoptera: Formicidae) in port cities and in major towns along the border in Côte d'Ivoire: a rapid assessment to detect potential introduced invasive ant species. Journal of Animal & Plant Sciences, 2018. Vol.36, Issue 1: 5793-5811 <http://www.m.elewa.org/JAPS> ; ISSN 2071-7024.

Loko Yêyinou L. E., Orobiyi A., Toffa J., Agre P., Tamo M. & Roisin Y. (2019). Termites (Blattodea: Termitidae) diversity and assemblages in different yam fields habitats in central Benin. Entomologie Faunistique – Faunistic Entomology 2019 72, 111 - 127. <https://popups.uliege.be/2030-6318/index.php?id=4621>

Loko Y. L., Agre P., Orobiyi A., Dossou-Aminon I., Roisin Y., Tamo M. and Dansi A. (2015) Farmers' knowledge and perceptions of termites as pests of yam (*Dioscorea* spp.) in Central Benin. International Journal of Pest Management, 75-84. <http://dx.doi.org/10.1080/09670874.2015.1107151>

Milenge K. H., Nshimba S-M. H., Masumbuko N. C., Nabahungu N. L., Degreef J. & De Kesel A. (2019). Host plants and edaphic factors influence the distribution and diversity of ectomycorrhizal fungal fruiting bodies within rainforests from Tshopo, Democratic Republic of the Congo. Accepted manuscript, African Journal of Ecology, DOI:10.1111/aje.12595

Tadu Z., Djiéto-Lordon C., Messop Youbi E.B., Fomena A., Babin R. (2014). Ant diversity in different cocoa-based habitats in the Centre Region of Cameroon. African Entomology, 22(2): 388-404.

Tadu Z. Djiéto-Lordon C., Youbi E.M., Aléné, C.D., Fomena A., Babin R. (2014) Ant mosaics in traditional cocoa agroforestry systems: influence of shade on the occurrence and spatial distribution of dominant ants. Agroforestry systems, 88 (6): 1067-1079.

Vanderhaegen K, Naturinda Z, Kouakou LMM, Vanderheyden A, Dekoninck W (2019) First record of the invasive longhorn crazy ant, *Paratrechina longicornis* (Latreille, 1802) (Hymenoptera: Formicidae) from Mt. Elgon, eastern Uganda. *BiolInvasions Records* 8(3): 505–514, <https://doi.org/10.3391/bir.2019.8.3.05>

Wiesner J. and Constant J. (2019) Records of tiger beetles (Coleoptera: Cicindelidae) collected in Cambodia, with description of a new species. 149. Contribution towards the knowledge of the Cicindelidae. *Insecta Mundi* 0700: 1–12 ZooBank Registered: urn:lsid:zoobank.org:pub:D24FC5A1-3B40-4E8A-931B-B3EBCOFFD1A8

Yêyinou Loko L. E., Orobiyi A, Agre P, Dansi A, Tamò M and Roisin Y. (2017) Farmers' perception of termites in agriculture production and their indigenous utilization in Northwest Benin. *Journal of Ethnobiology and Ethnomedicine* 13:64 <https://doi.org/10.1186/s13002-017-0187-2>

Edible mushrooms:

Milenge K. H., Nshimba S-M. H., Masumbuko N. C., Nabahungu N. L., Degreef J. & De Kesel A. (2019). Host plants and edaphic factors influence the distribution and diversity of ectomycorrhizal fungal fruiting bodies within rainforests from Tshopo, Democratic Republic of the Congo. Accepted manuscript, African Journal of Ecology, DOI:10.1111/aje.12595

Milenge Kamalebo H., Nshimba Seya Wa Malale H., Masumbuko Ndabaga C., Degreef J. and De Kesel A. (2018). Uses and importance of wild fungi: traditional knowledge from the Tshopo province in the Democratic Republic of the Congo. Journal of Ethnobiology and Ethnomedicine. 14:13 DOI 10.1186/s13002-017-0203-6

Milenge K. H., Nshimba S-M H & De Kesel A. (2018). Macrofungal diversity in Yangambi Biosphere reserve and Yoko reserve rainforests of the Democratic Republic of the Congo. International Journal of Biodiversity and Conservation 10(9): 348-356, DOI: 10.5897/IJBC2018.1188

5-Policy Briefs

CEBioS co-produces a series of 'Policy briefs' with a network of South partners. This is done in the context of participative workshops within the subprograms MRV, marine modeling or GTI. The policy briefs are intended to translate scientific findings into a language which can be understood by policy makers, decision makers, as well as local communities. They are in fact decision support tools, leading to a better understanding of the environmental factors related to biodiversity degradation. The co-production by the South researchers and authorities ensures a high ownership and local uptake.

Here is a selection of Policy briefs, deemed relevant to the problematics associated with livelihoods, poaching, bushmeat and deforestation, topics which have an indirect impact on zoonoses.

- Monitoring natural resources in protected areas: developing biodiversity indicators in and around protected areas in East- and West Africa and the Middle East
- Pêche: secteur productif en danger en RD Congo
- RD Congo: faune sauvage menacée par le commerce de la viande de brousse
- L'exploitation de charbon de bois dans les écosystèmes naturels est-elle durable en RD Congo?
- The sardine fisheries of Lake Tanganyika (in preparation)

All Policy Briefs are accessible online: <http://www.biodiv.be/cebios2/docs/publications/policy-briefs>

6-Technical manuals: Lexica and abcTaxa and Unesco-MAB manual

- CEBioS co-produces with local stakeholders 'lexica' to describe habitats of protected areas, a tool very useful and in demand by local managers. See <http://www.biodiv.be/cebios2/docs/publications/habitat-monitoring-lexicons>
- CEBioS finances and promotes the production and distribution of the widely acclaimed AbcTaxa series on the identification and collection management of selected taxa. See <http://www.abctaxa.be/>

- CEBioS, through its BELSPO-funded EVAMAB project has produced a Manual for UNESCO-Man and The Biosphere Programme for Biosphere reserves in Africa, to better understand and use Ecosystem Services in their management (in preparation). Evamab, see <http://www.biodiv.be/evamab>

These manuals are invaluable tools for local managers to better understand, manage and protect protected areas and their biodiversity, and hence avoid further degradation of habitats, which can lead to zoonoses.

7- CEBioS awareness & information activities

- We operate an 'awareness call' to capacitate our partners on awareness raising on biodiversity in their country.
- We operate a Clearing House Mechanism call to strengthen our CHM partners to make biodiversity relevant information accessible to policy makers and the public.
- CEBioS is involved in the VLIR-UOS efforts at UNIKIS/CSB to strengthen partners to help discern correct information about Covid 19 from fake news.

8-Research by Dr. Erik Verheyen (RBINS) and partners

(Some of his activities are supported by CEBioS earmarked funds for part of work at the 'Centre de Surveillance de la Biodiversité' in Kisangani, RDC)

1. Research projects

BIODIVERSA

'Biodiversity changes in African forests and Emerging Infectious Diseases: should we worry' (BIODIV-AFREID) , funded by BELSPO

We will investigate how biodiversity conditions (dis)favour spill-over of infectious agents into human populations in African forests. This is crucial for predicting and controlling the risk of new outbreaks under changing biodiversity scenarios. In order to investigate this process, we propose 1° to link changes in biodiversity to changes in communities of reservoirs and the pathogens they carry and 2° to link differences in these reservoir communities to human health. The proposed research activities will focus on Monkeypox and Ebola viruses but a broader spectrum of pathogens will be included so that we can cover a range from pathogens that are relatively common in a variety of small mammals (MPXV) to pathogens that are rare and found in very few species only (EBV). The proposed study will be conducted in DR Congo and Côte d'Ivoire, in areas where these emerging diseases have been observed before and make optimal use of the large sample collections that have been collected earlier in these areas by the consortium partners.

Partners: UAntwerpen, IRD Montpellier, France; RKI, Germany, CSB UNIKIS, DR Congo & ONE Health for All" in Côte d'Ivoire

2020-2022

Fed-tWin, Programme for sustainable research cooperation between the federal scientific institutions and the universities, funded by BELSPO

'Uncovering the origin of recent and future zoonotic epidemics in tropical Africa'

The proposed FED-tWIN profile aims to unite and strengthen existing expertise on mammal taxonomy, ecology and molecular biology (mammalian and pathogen genomic) skills that are required to address the above questions while making maximal use of the natural history collections of the RBINS and collaborating museums.

Partner: UAntwerpen

2020-permanent position?

FWO, Senior research projects fundamental research. Funded by FWO-V

'Identifying sylvatic reservoir species of outbreak-prone arthropod borne viruses through large-scale serostatus mapping in African wildlife'

This project aims to revisit dogmas on the animal reservoir and ecology of arboviruses in African countries with high likelihood for (re)emergence of these zoonotic infections. The main objective is to establish new insights in the sylvatic life cycle of arboviruses and create for the first time a clear picture on which animal species are involved in maintaining arboviruses in Africa during enzootic periods. Subsequent phylogeographic analysis of species for which seropositive specimens are detected will indicate potential distribution ranges and hotspots of various arboviruses throughout the continent. Identifying these animal reservoir species and their geographic distribution ranges will be instrumental to better predict, control and prevent arbovirus spill over and emergence of epidemics in humans.

Partners, ITM & IRD Montpellier, France

2020-2023

VLIR PP CUI, phase I, II, III project 2, funded by VLIR UOS, DGD

'Apport de la biodiversité à la formation et la sécurité alimentaire dans le Bassin Nord-est du Congo (Kisangani, R.D. Congo)'

The aim of project 2 is to strengthen the operational capacity of UNIKIS in the field of scientific research for the rational and sustainable management and exploitation of natural resources by the local population. Inventory of biodiversity in the region (edible plants and fungi; reptiles, amphibians, mammals and their zoonoses) and study of algae in the context of water quality & fish farming. Domestication of edible mushrooms, breeding of rats to replace bushmeat for food security. Research results for governments and NGOs involved in forest and wildlife management, as well as smallholder farmers' organizations, on the dissemination of project results. Indirect: Contribute to improving family income, increasing food security and thus reducing poverty.

Partners: UNIKIS, LUC, Meise, UGent, UA

2011-2021

EBOVAC3 project in DR Congo, funded by Europe's partnership for health,
<https://www.imi.europa.eu/content/ebola-programme>

The Ebola vaccine projects – EBOVAC1, EBOVAC2, EBOVAC3, EBODAC and EBOMAN – are a series of trials and associated projects which aim to assess a novel two-dose preventive vaccine regimen against Ebola Virus Disease (EVD).

As a small part of this Vaccination Programme, an ecological study will trace the presence of Ebola and Monkeypox in the areas where the human population (i.e. caregivers) will be vaccinated.

Partners, UA, UNIKIS, INRB, RBINS

2020-2021

PhD project Mande Claude, funded by CIFOR

'Afrotropical bat's functional variability as a disturbance impact indicator'

Functional and taxonomic diversity investigations are used to seek what species are resilient towards forest habitat degradation, and hence likely to live near human settlements, making them possible vector species for Ebola and other pathogens.

Partners: UNIKIS, Ecohealth Alliance, CIFOR, UA

2018-2021

2. Submitted proposals

- The BIODIVERSA project 'Biodiversity changes in African forests and Emerging Infectious Diseases: should we worry' (BIODIV-AFREID)' was earmarked for possible additional funding provided we submitted an adapted program to include a survey of the coronavirus diversity in wildlife. Decision is pending.
- VLIR-UOS consults project coordinators of ongoing VLIR projects in order to assess what can be done at the level of VLIR-UOS to support local partners in the corona era. Our suggestion to support the expertise developed in UNIKIS to combat fake news and conspiracy theories in DR Congo has been well received. How to achieve corona activities in our project -or across all projects simultaneously- without additional resources is being researched, perhaps resources that are not currently available (e.g. travel money, fellowships, ...) can be used.

3. Media & events

- [Conference Dead or alive : Towards a sustainable wildlife trade. One World One Health recommendations](#); 3-4 December Brussels, Belgium.

The aim of the conference is to launch an interdisciplinary discussion on sustainable wildlife trade through two specific experiences recently gained by Belgium in the field of bushmeat trade (day one) and trade in reptiles and amphibians (day two). It will allow a discussion on the risks posed by this trade at the interface between human health, animal health and environmental health.

- 03/12/2019: [Interview on Illegal bushmeat trade](#) at the occasion of the 'One World One Health Conference on wildlife trade', organised by The Federal Public Service Health, Food Chain Safety and Environment and the Belgian Biodiversity Platform, 3-4 December 2019, Brussels, Belgium (Erik Verheyen) <https://www.biodiversity.be/4854>
- 25/10/2019: [Interview by the VLIR-UOS communication service](#) of Pierre Van Damme and Jean-Pierre van geertruyden and Erik Verheyen for articles for their 20-year VLIR UOS publication and 'impact stories' for the VLIR UOS website/social media on the "topic infectious diseases" and the EBOVAC3 project in DR Congo
- 03/04/2020: [Is het coronavirus de schuld van vleermuizen?](#) Door Herwig Leirs, Frederik Van de Perre en Erik Verheyen, <https://blog.uantwerpen.be/corona/coronavirus-vleermuizen/>
- [In press: Wat zijn zoönoses en waar komen ze vandaan?](#) <https://blog.uantwerpen.be/corona> (not yet online)
- [in press: Wat kunnen we doen om zoonoses in de toekomst te vermijden?](#) <https://blog.uantwerpen.be/corona> (not yet online)

4. Publications

Gaubert P, Antunes A, Meng, Lin M, Peigné S, Justy F, Njiokou F, Dufour S, Danqua E, Verheyen E, Stanley W. T, Johnson W. E, O'Brien S. J, Luod S-J. 2017. The complete phylogeny of extant pangolins : scaling up the molecular tracing of the most trafficked mammals on earth. *Journal of Heredity*, 2017, 1–1 - <https://doi:10.1093/jhered/esx097>

Olayemi A, Obadare A, Oyeyiola, Fasogbon S, Igbokwe J, Owolabi M, Igbahenah F, Ortsega D, Gunther S, Verheyen E, Elisabeth Fichet-Calvet. 2017. Diversity and Population Dynamics of Small Mammals within Nigeri, with Emphasis on Reservoirs of the Lassa Virus. *Systematics and Biodiversity* Systematics and Biodiversity - <https://DOI.10.1080/14772000.2017.1358220>

Van Caeckenberghe V, Gembu G-C, Musaba P, Seamark E, Verheyen E. 2017. The bats of the Congo and of Rwanda and Burundi Revisited (Mammalia : Chiroptera). *European Journal of Taxonomy* 382 : 1–32 - <https://doi.org/10.5852/ejt.2017.382>

Accepted

Gryseels S, Mbala-Kingebeni P, Akonda I, Angoyo R, Ayoyuba A, Baelo P, Bugenthö E, Bushmaker T, Butel C, Calvignec-Spencer S, Delaporte E, De Smet B, Dux A, Fischer R, Kahandi C, Kapetschi J, Kimbondja S, Kouadio L, Malekani Bendeke A, Mande C, Mdingi G, Moudimba J, Mpoudi Ngole E, Mukadi D, Musa ba P, Mutombo P, Ndong Bass I, Nebesse C, Ngoy S, Ndibu S P, Seifert S, Tanzito J,

Dudu A, Amundala N, Ariën K, Gembu G C, Leendertz F, Leirs H, Mukinzi J-C, Munster V, Muyemebe-Tamfum J-J, Peeters M, Verheyen E, Ahuka-Mundeke S. (). Zoonotic investigations of Ebolavirus in Likati, Democratic Republic of Congo, 2017. *Emerging Infectious Diseases* (accepted)

Submitted

Gombeer S, Nebesse C, Musaba P, Ngoy S, Peeters M, Vanderheyden A, Meganck K, Smits N, Geers F, Van Den Heuvel S, Backeljau T, De Meyer M, Verheyen E. (). Bushmeat for sale in Brussels, Belgium : A pilot study. *Biodiversity and Conservation*

Mikula O, Nicolas V, Šumbera R, Konečný A, Denys C, Verheyen E, Bryjová A, Lemmon A R, Lemmon E M, Bryja J. (). Nuclear phylogenomics, but not mitogenomics, resolves the most successful late Miocene radiation of African rodents (Rodentia : Muridae : Arvicanthini). *Molecular Phylogenetics and Evolution*

Ngoy S, Gembu G C, Verheyen E, Gambalemoke S, Mubenga Kankonda O, Laudisoit A (). Cattle massively infested by up to seven hard tick species (Ixodina) at Mongobo slaughterhouse, Kisangani (D.R. Congo). *Belgian Journal of Entomology*
