

Biodiversity comparison between three contrasted land uses in South-Eastern Cameroonian moist forests:

A protected area, community forests and a certified logging concession

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Background



Human populations are increasing with their associated needs (food, timber and fuel wood) and pressure on forest ecosystems.



Land use changes, caused by increasing human pressure on those ecosystems, are major threats to biodiversity in the tropics (Sala *et al.*, 2000 ; Pereira *et al.*, 2010).

A global stake is thus to understand the impacts of those important changes on ecosystems and biodiversity!

Main research question
Sub-questions

What are the impacts of current land uses on biodiversity in Central African moist forests?

Are protected areas really able to conserve biodiversity?

The effectiveness of protected areas in conserving biodiversity has been questioned (Porter-Bolland *et al.*, 2012).

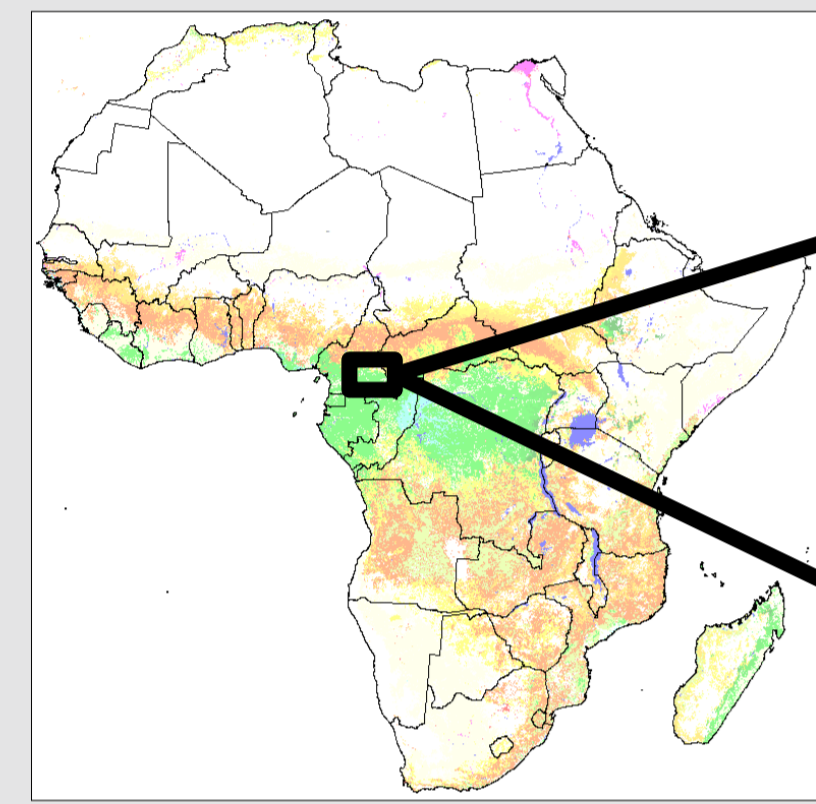
Biodiversity levels in tropical protected areas are mainly linked to their surrounding habitats and human pressure: habitat disruption, hunting and forest-product exploitation can be considered as the strongest predictors of declining biodiversity (Laurance *et al.*, 2012).

Can selective logging also take part in the conservation of biodiversity?

There is a current debate on the effect of logging on biodiversity: some authors argue that there is no significant effect of selective logging (Putz *et al.*, 2012), whereas others claim that logging is detrimental to biodiversity (Zimmerman & Kormos, 2012).

There are increasing efforts of certified logging companies to take environmental and social components in consideration, in addition to economic return. There is also a general agreement saying that « to persist, tropical forests need to be productive ».

Study area

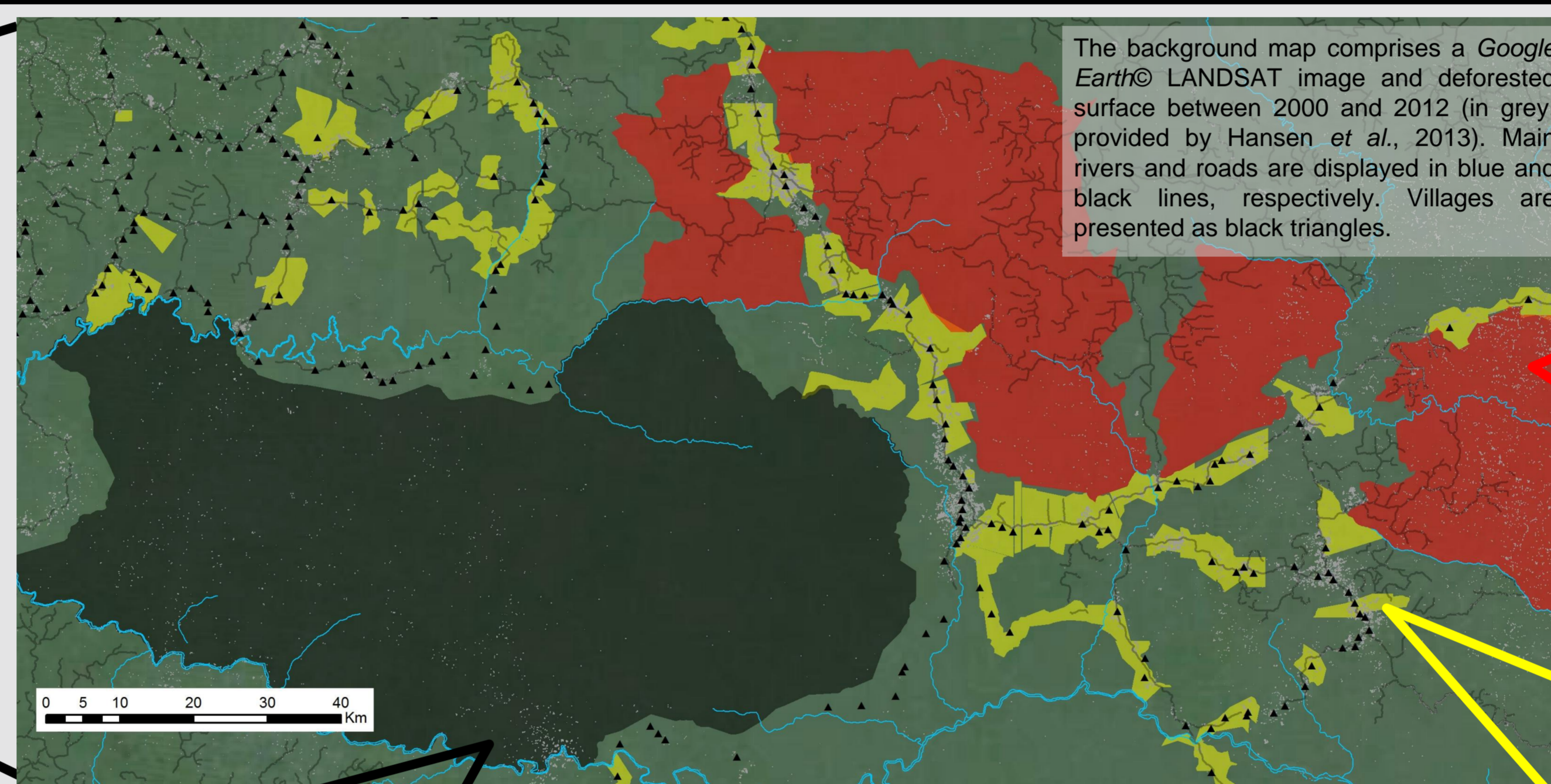


South-Eastern Cameroon:

Moist semi-deciduous forest (Fayolle *et al.*, 2014), canopy dominated by long-lived light-demanding species and long history of human disturbance (Morin-Rivat *et al.*, 2014)

High biodiversity levels and emblematic animal species:

Large mammals such as forest elephant, Western lowland gorilla, chimpanzee or panther



Pallisco logging company:

389,000 hectares
Timber exploitation since 1999
FSC-certified since 2008
Felling cycle: 30 years
Permanent forest estate
Considered as a « good student » in FSC certification

Community forests:

Form of participatory and decentralized forest management at the level of the village community (maximum of 5,000 hectares for each community forest)
506,000 hectares in the Eastern Region
First implementations in 1994
Management plan for 25 years
Degraded forests generally situated along roads
Non permanent forest estate

Main forest land uses in Central Africa:

Protected areas

Community forests

Logging concessions

Dja Wildlife Reserve: Agriculture and commercial hunting are forbidden

528,000 hectares
Created in 1950
IUCN category VI
Anti-poaching patrols and education
Management plan for 5 years
Permanent forest estate
Mature to old growth forest with 3 forest types (Sonké, 1998): forests on rocks (5%), forests on hydromorphic soils (20%) and terra-firme forests (75%)

Methodology

In each of the 3 land uses, assessment of biodiversity with a sampling of **Wildlife** & **Vegetation**

Two indicator taxa: Large mammals and dung beetles are chosen as classic biodiversity indicators and are linked with forest dynamics: they both provide meaningful ecological services such as primary and secondary seed dispersal (Culot *et al.*, 2013 ; Stokes *et al.*, 2010).

Large mammals



Direct and indirect signs of presence along trails

✓ 1272 kilometers

Camera-trapping

✓ 40 cameras

Ongoing analysis for densities estimation and rarefaction approach (Gotelli & Colwell, 2001)

Orders	Species	Dja Wildlife Reserve	Community forests	Pallisco concession
Artiodactyla	<i>Cephalophus</i> spp.	✓	✓	✓
	<i>Hyemoschus aquaticus</i>	✓	✓	✓
	<i>Tragelaphus spekii</i>	✓	✓	✓
	<i>Tragelaphus eurycerus</i>	✓	✓	✓
	<i>Potamochoerus porcus</i>	✓	✓	✓
	<i>Syncerus caffer nanus</i>	✓	✓	✓
Primates	<i>Cercopithecus</i> spp.	✓	✓	✓
	<i>Cercocebus agilis</i>	✓	✓	✓
	<i>Colobus gureza</i>	✓	✓	✓
	<i>Colobus satanas</i>	✓	✓	✓
	<i>Pan troglodytes</i>	✓	✓	✓
Pholidota	<i>Gorilla gorilla gorilla</i>	✓	✓	✓
	<i>Phataginus tricuspis</i>	✓	✓	✓
	<i>Smutsia gigantea</i>	✓	✓	✓
Proboscidea	<i>Loxodonta cyclotis</i>	✓	✓	✓
	<i>Civettictis civetta</i>	✓	✓	✓
Carnivora	<i>Panthera pardus</i>	✓	✓	✓

Composition & structure:

- List of species
- Tree density
- Basal area
- Canopy openness

Installation of 42 x 1 ha plots is ongoing

✓ 400 hemispherical photographs

Ongoing analysis of images

High variability of canopy openness for all forest types:



From dense forest stands with thick lianas cover...



...to large canopy gaps due to logging and trees natural mortality.

Dung beetles



72 baited pitfall traps checked after 48 hours (24 for each land use)



Total number of collected dung beetles

Land Use	Total number of collected dung beetles
Dja Wildlife Reserve	2,070
Community forests	1,631
Pallisco company	1,372

Dominant species already identified:

Onthophagus fuscicornis d'Orbigny
Proagoderus semiiris Thomson
Sisyphus arboreus Walter

Identification is still ongoing



A high total abundance of dung beetles is not a measure of diversity and can even sometimes be obtained in degraded forests: some particular species can show extremely high abundances and the diversity of dung beetle communities can be particularly low (Culot *et al.*, 2013 ; Davis, 2000 ; Nichols *et al.*, 2007).

Perspectives

The acquired data will be used to compare the **impacts of land uses** on animal and vegetal diversities. The influence of **vegetation structure** on overall biodiversity will also be quantified for each land use. Finally, this research project will allow to give practical recommendations for the use of **appropriate biodiversity indicators** in Central African moist forests.

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