PROJECT: Preliminary survey of the current distribution and conservation status of the poorly known and critically endangered *Piliocolobus bouvieri* in the Republic of Congo

PRINCIPAL INVESTIGATOR: Lieven Devreese
PROJECT PERIOD: three months between January and July 2015
TOTAL BUDGET: $5000

ABSTRACT: Bouvier's red colobus (*Piliocolobus bouvieri*) is regarded as critically endangered. The species has not been observed by scientists for almost forty years and its survival to the present time has been questioned. Information on the distribution of the species is based on very few and confusing museum records. No current information on the species is available, thereby hindering adequate conservation actions. The inaccessibility of the riverine habitat of *P. bouvieri* makes scientific work in the region extremely difficult. This inaccessibility could potentially provide a good level of protection for the species. However, red colobus monkeys are generally heavily hunted throughout Africa and are particularly vulnerable to extirpation and extinction via hunting. Using interviews and field surveys, this study will try to determine 1). whether *P. bouvieri* is still present, 2). what its current distribution is and 3). which threats weigh on its survival.

1. Introduction

a. Justification of proposal

Bouvier's red colobus, *Piliocolobus bouvieri* (Rochebrune, 1887), probably represents the least known taxon of red colobus. It is endemic to the Republic of Congo and has a small geographic range on the right bank of the lower Congo River (Groves, 2001). Until recently *P. bouvieri* was grouped together with Pennant's red colobus (*P. pennantii*) from Bioko and the Niger Delta red colobus (*P. epieni*) as subspecies of a single species (Mittermeier et al., 2013). *P. bouvieri* is labelled as critically endangered on the IUCN red list (Oates & Struhsaker, 2008) and *P. pennantii sensu lato* has been included several times in the list of the world's 25 most endangered primates (Schwitzer et al., 2014). The populations on Bioko and in Nigeria have received considerable conservation attention (Anonymous 2013; Cronin et al., 2010; 2013), while *P. bouvieri* has been totally neglected. However, *P. bouvieri* has not been observed by scientists for almost forty years and its survival to the present time has been questioned (Struhsaker, 2005). An investigation of the distribution and conservation status of the species has been given utmost priority in the literature (Groves, 2007; Butynski et al., 2013), but to date the concerns about its survival have not been translated into action on the ground. This study wants to fill in this gap. The preliminary data we intend to collect will give an indication of 1). whether *P. bouvieri* is still present, 2). what its current distribution is and 3). which threats weigh on its survival.

b. How project addresses primate conservation

Sound knowledge on the current distribution and conservation status of a species is crucial to determine conservation priorities. Virtually nothing is known about *P. bouvieri*. The preliminary results of this first-ever study on the species will hopefully allow us to pinpoint potential areas of high conservation value for the species. In the worst case, this study might be a first indication of the extinction of possibly a second red colobus taxon in the twenty-first century (Oates et al., 2000; McGraw, 2005). However, proving the absence of a species is difficult and more survey work will probably be needed to confirm the possible extinction of *P. bouvieri*.

2. Background Information

a. Prior research

None.

b. Prior conservation

None. *P. bouvieri* has not been reported to occur in any protected area. Habitat loss and destruction seem to be of minor importance in the area. Commercial bushmeat hunting can be expected to be a significant threat to the species (see below).

c. Distribution of *P. bouvieri*

The distribution of *P. bouvieri* is mainly based on a very limited number of museum records and a single report (Fig. 1). Malbrant and Maclatchy (1949) state that the species occurs on the right bank of the Congo River between the Alima and the Sangha Rivers. It is probably restricted to the more continuous forest tract in this landscape. To the south and west of the presumed distribution of *P. bouvieri* the habitat gradually changes to a forest-savannah mosaic with increasing dominance of savannah. Malbrant and Maclatchy (1949) note a very localized distribution. They recorded *P. bouvieri* on the left bank of the Likouala River, as far as Ntokou, but were not able to find any colobus on the right bank of this river. Along the Sangha River the species was cited as abundant on the right bank, but absent to the east of the Sangha River (Malbrant & Maclatchy, 1949). The locality of the type specimen of the red colobus form *nigrimanus*, a junior synonym of *P. oustaleti*, is situated at Lingara village between the Sangha and the Congo Rivers. It could thus be hypothesized that the lower Sangha River represents the border between both species. However, another *P. oustaleti* museum specimen is recorded from Pombo village, situated within the presumed range of *P. bouvieri*. More data are needed to clarify the distribution of both species. No records of red colobus are known from the interfluve between the Sangha and the Likouala-aux-Herbes Rivers. Wide rivers can be expected to represent significant barriers for these primate species.

Two independent sightings of red colobus from Inoni village around 1970, south of the Lefini River still await confirmation (Groves, 2007). This location is situated 200km to the south of the Alima River in a region with only limited forest cover, which makes the presence of red colobus very surprising, although not impossible. Actually,

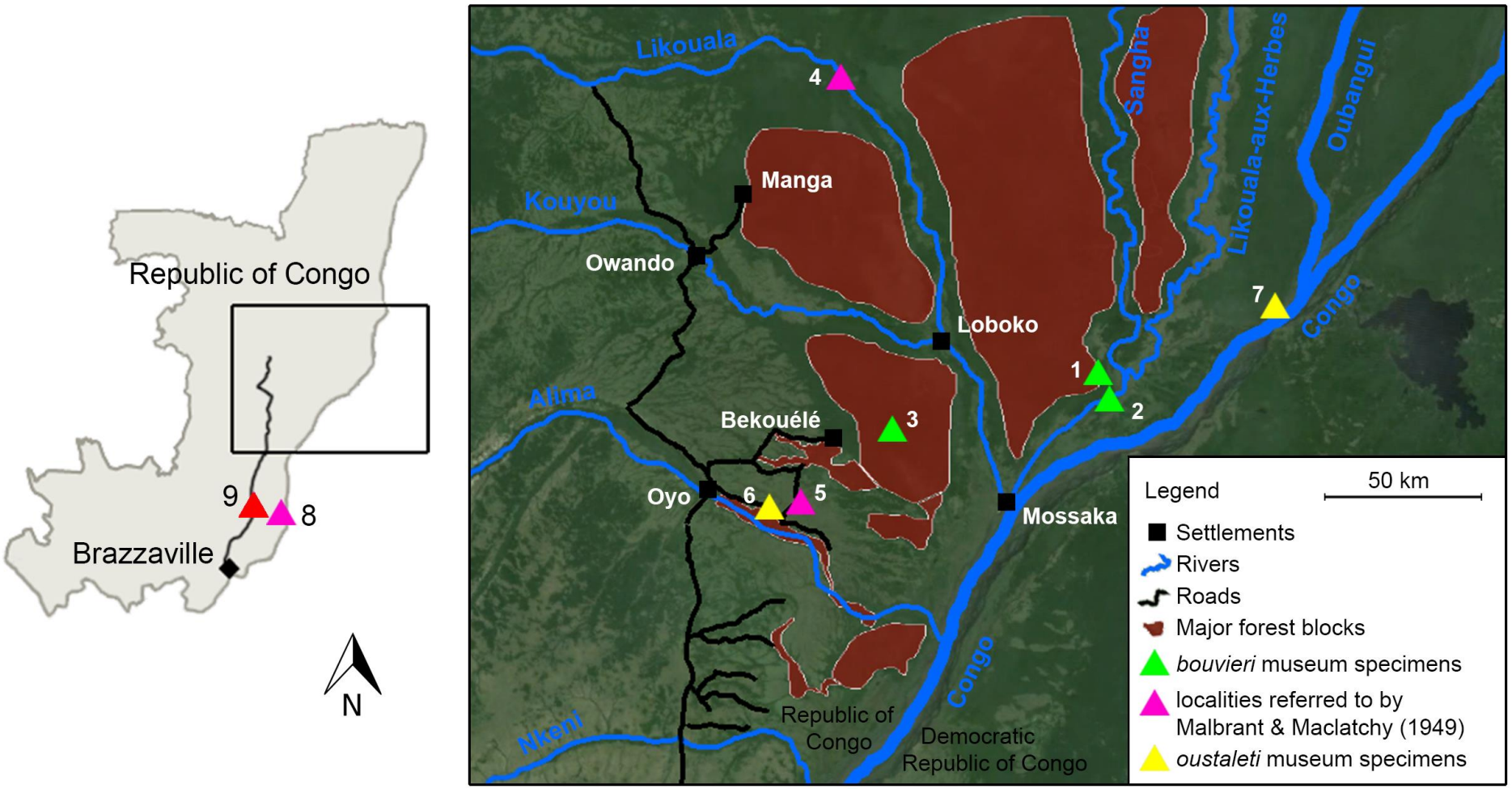

Fig. 1. The geographical area where *Piliocolobus bouvieri* is supposed to occur in the Republic of Congo. The small map on the left shows the N2 national road between Brazzaville and Owando near the survey area shown on the map on the right. The following locations have been collected from museum specimens and the literature: 1). Mongo, type locality of *P. bouvieri* (Rochebrune, 1887) kept at MNHN described as 'on the right bank of the Congo, two days' journey by boat above the mouth of the Alima River' (see Moreau et al., 1946), but actually located along the Sangha River (Gippoliti & Agnelli, 2014); 2). Type locality of *likualae* (Matschie, 1914) opposite mouth of Likouala-aux-Herbes River, kept at MNHB; 3). Butando, locality of a *P. bouvieri* specimen in PCM and one in NHM; 4). Ntokou and 5). Moaké between which *P. bouvieri* was reported by Malbrant and Maclatchy (1949); 6). Pombo, locality of a *P. oustaleti* specimen at MNHB; 7). Liranga, type locality of *nigrimanus*, a junior synonym of *P. oustaleti*, kept at MNHN; 8). Ngabe, around which *P. bouvieri* was reported by Malbrant and Macclatchy (1949); and 9). Inoni, where two independent sightings reported red colobus in the 1970s (Groves, 2007).
PCM: Powell-Cotton Museum; NHM: Natural History Museum, London; MNHB: Museum für Naturkunde der Humboldt-Universität, Berlin; MNHN: Muséum National d'Histoire Naturelle, Paris.

Malbrant & Maclatchy (1949) earlier noted the presence of *P. bouvieri* near Ngabe on the right bank of the Congo River opposite of the mouth of the Kwa River, which is about sixty kilometres from Inoni. However, recent survey work in the Lefini and Lesio-Louna Reserves by staff of The Aspinall Foundation have not been able to find red colobus (King et al., 2006) and the species is almost certainly locally extinct in this area (pers. comm. T. King, 2014).

d. Conservation status of *P. bouvieri*

Throughout Africa red colobus seem to show a preference for two types of habitat: 1). terra firme forest and 2). swamp forest. The former is preferred by species like *P. badius*, *P. tholloni* and *P. tephrosceles*, while *P. epieni* and certain populations of *P. oustaleti* along the Sangha River occur mainly in swamp forest along major rivers (Mittermeier et al., 2013; pers. comm. F. Maisels). The area of distribution of *P. bouvieri* is characterised by extensive swamp forests along major tributaries of the Congo River. Reports of the species often state swamp forest as the habitat type. However, this pattern might be biased because river-based transportation is the main way to access the area (Butynski et al., 2013).

The inaccessibility of the riverine habitat of *P. bouvieri* makes scientific work in the region extremely difficult. This inaccessibility could potentially provide a good level of protection for the species. However, red colobus monkeys are generally heavily hunted throughout Africa because of several reasons. These large-bodied monkeys represent a good catch and are often preferred by hunters (Oates, 1996). They live in large, noisy groups, are not particularly good at detecting predators or hunters, and often exhibit curious or defensive behaviour upon being detected by a hunter (Oates, 1996; Struhsaker, 2005; pers. obs.). This makes red colobus highly vulnerable to extirpation or extinction due to overexploitation. Natural densities of non-hunted *Piliocolobus* populations range from 33 to ≥260 individuals per km² (Fashing, 2007). Hunting levels throughout Central Africa are ever-increasing to meet the bushmeat demands of the rapidly growing populations in the cities. The commercial bushmeat trade is particularly flourishing where cartridges are available and carcasses can easily be transported. Major rivers are important axes in the bushmeat trade and for this reason *P. bouvieri* populations along the Congo River and its tributaries could possibly be under severe hunting pressure.

e. The phylogenetic enigma of *P. bouvieri*

The genus *Piliocolobus* is one of the most diverse of African monkeys and its taxonomy has long been a point of confusion and discussion. A recent study using mitochondrial DNA was able to shed a much clearer light on the phylogenetic relationships among the different taxa (Ting, 2008). However, *P. bouvieri* was the only species not included in the analyses, because of the difficulty of acquiring samples. Its former association with *P. pennantii* and *P. epieni*, each located more than 1000 km to the northwest, suggest a rather difficult to explain biogeographic scenario. Faecal samples or biopsies from hunter-killed specimens could be used in a future molecular study to investigate the phylogenetic positioning of *P. bouvieri* among the other species in the genus.

3. Project description

a. Goals

We want to fill in the total lack of data on *P. bouvieri* in order to understand better its conservation status by starting a study on its distribution between the lower Alima and Sangha River in the Republic of Congo.

b. Specific aims

We will investigate the data collected during the planned field survey which will give us an indication of:

1). whether *P. bouvieri* is still present,

2). what its current distribution is, and

3). which threats weigh on its survival.

c. Project design and implementation

A complete list of historic distribution locations of *P. bouvieri* has been compiled based on old museum records and literature data (Fig. 1). This list will be double-checked to avoid errors in the localisation of old museum record localities and if possible, completed with information obtained from personal communication with different people.

The field study will consist of a 2- to 3-month survey expedition between the lower Alima and Sangha Rivers with the aim to survey four forest blocks (see Methods). Interviews with local people will be conducted to acquire additional information about the conservation status of *P. bouvieri*.

d. Disease transmission

There will be no close contact with wild primates.

4. Methods

a. Hypotheses

Two hypotheses can be formulated regarding the conservation status of *P. bouvieri*. The highly inaccessible habitat where the species occurs might provide it with a certain level of protection from hunting. The difficulty of doing scientific work in this region might explain the lack of sightings in the last decades. Thus, the conservation status could be not as critical as currently understood. Alternatively, the distribution of *P. bouvieri* along major rivers used as axes in the commercial bushmeat trade might have severely impacted its population size, especially given the vulnerable behaviour of red colobus in general. If in the worst case no signs of red colobus would be found. This might hint towards its extinction.

b. Survey methods

b.1. Interviews with local people

At different localities we will conduct interviews with locals, particularly experienced hunters, using pictures of several primate species present in the area, as well as closely-related and distantly-related species from other areas in Africa. Drawings will be avoided as much as possible, as the local people often have difficulties in recognizing them. However, no pictures are available of living *P. bouvieri* specimens, so for this species we will fully rely on pictures of related species (eg. *P. tholloni* from south of the Congo River). We will ask the interviewees to name all primates he or she recognizes to determine the reliability of the answers. Calls of a related species (*P. tholloni* recorded at the LuiKotale Bonobo Project) will be used to test the

interviewee's knowledge. A simple standard questionnaire will allow us to collect data on the hunting practices of the local people. Ethnoprimatological data will be collected opportunistically.

b.2. Survey schedule

We hope to confirm the presence of *P. bouvieri* and map its general distribution, focusing on major rivers as potential geographical barriers. More detailed information on the situation in the field (concerning location of villages, transport, food supplies) will be gathered over the coming months to plan the expedition thoroughly. We are in contact with Mark Gately from WCS-Congo who provided the first on-site information. Several modes of transport are possible: on foot, in a dug-out canoe with or without outboard motor, or by bicycle, motorcycle or car. Multiple airstrips are available in the area in case of emergency.

We define five sectors where the presence of red colobus should be verified (Fig. 2). The description of the habitat in these sectors is based on satellite imagery.

Sector 1: South of the Alima River: this sector is mainly characterised by a forest-savannah mosaic with a high dominance of savannah. Riverine forest can be found along both sides of the Alima river and a larger tract of continuous forest is situated south of the lower part of the Alima River.

Sector 2: Between the Alima River and the Kouyou-Likouala Rivers: a forest savannah-mosaic is gradually replaced by a continuous forest tract north and east of Bekouélé village.

Sector 3: Between the Kouyou and Likouala Rivers: mostly continuous forest with swampy areas along the Likouala River.

Sector 4: Between the Likouala and the Sangha Rivers: continuous forest with extensive swampy areas along both rivers.

Sector 5: East of the Sangha River along both banks of the Likouala-aux-Herbes River: here we would expect the presence of *P. oustaleti*.

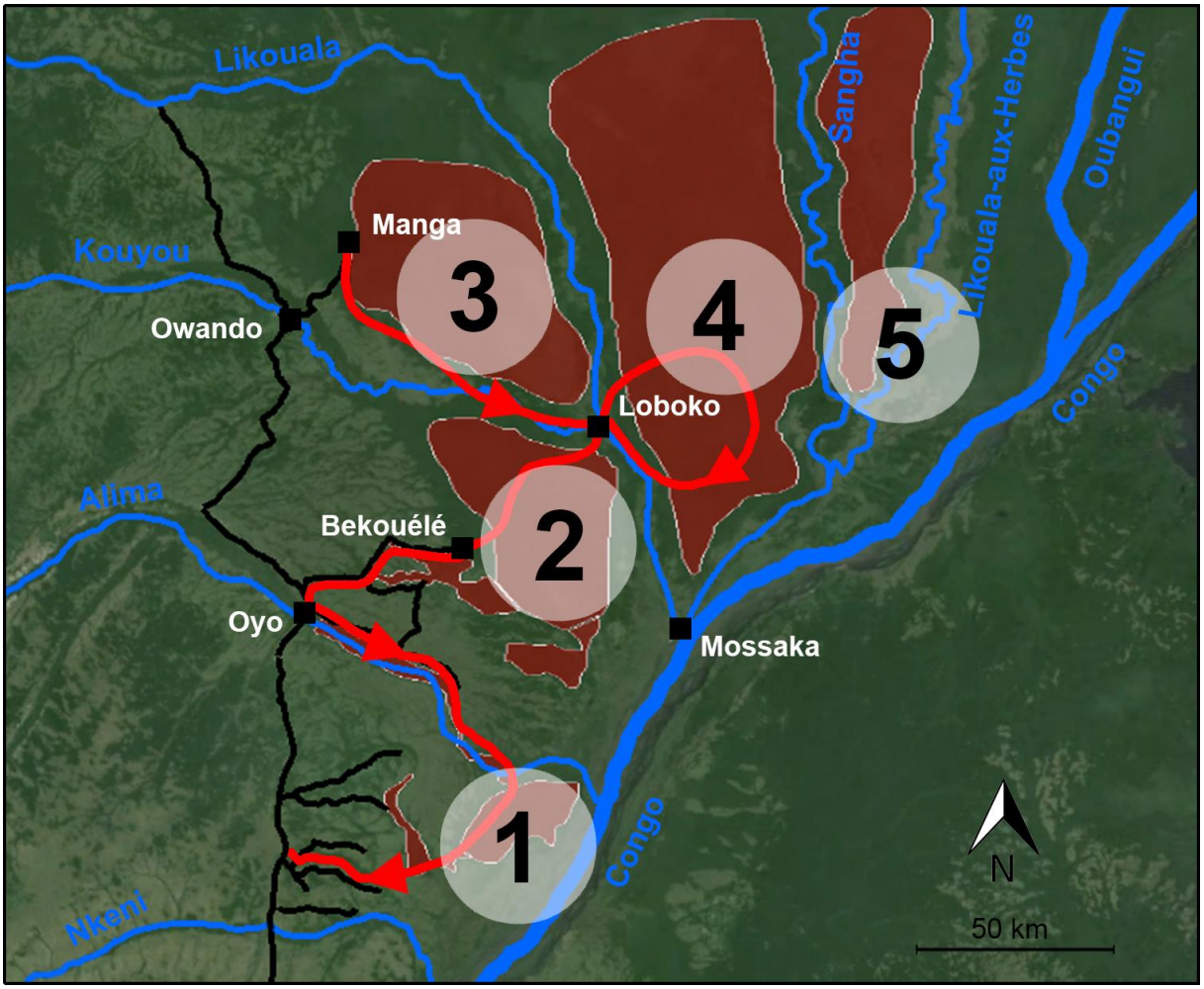

Fig. 2. The different sections where the presence of *Piliocolobus bouvieri* should be verified. In bright red the provisional route starting from Manga as described in the text.

The area on the left bank of the Sangha River (sector 5) is extremely difficult to reach and surveying it would require more time than is available for this preliminary study. The provisional route to efficiently survey several sectors as shown in figure 2 starts at Manga village in sector 3, which can be reached by road from Owando village situated along the asphalted N2 national road (approximately 550km from Brazzaville). After surveying the area near the village, we will conduct a 10-day hike to the east to reach Loboko village (approximately 90km) near the confluence of the Likouala and the Kouyou Rivers. Depending on local information the Kouyou River can also be followed downstream by boat to get to Loboko village, surveying along the river banks. Sector 4 can only be reached by crossing the Likouala River and stocking up supplies in Loboko village. After surveying sector 4 during a multiple-day

hike and along the Likouala River, we will return to Loboko village. From there we will hike to Bekouélé village (approximately 50km) in sector 2, surveying the continuous forest in between and to the east of Bekouélé village. A road is available connecting Bekouélé village with Oyo village along the N2 national road. The larger tract of continuous forest in sector 1 can be reached using the road north of the Alima River going east from Oyo village and by following the Alima River further downstream. Several roads south of the Alima River going east-west will allow a more easy way back to the N2 national road.

Depending on the time schedule a stop can be made at Inoni along the N2 national road on the way back to Brazzaville. The landscape around Inoni is heavily dominated by savannah and only narrow stretches of riverine forest are present. Interviews at the beginning of the expedition will give an indication as to decide whether it is worth spending much time around this locality.

For each of the proposed sectors we count at least 10 to 15 days. The total expedition will take two to three months. We will base the exact localities as well as our search effort in different habitats (terra firme vs. riverine swamp forest) and search strategy (multiple-day hikes vs. river-based searches in dug-out canoes) on information obtained from local people. Very few settlements are present in the major forest tracts, so interviews will be done wherever possible. The coming months we will gather more information from several sources to make a more detailed and realistic programme. Local conditions and uncertainties may cause adaptations to the original schedule. We will have to require permission from village chiefs to enter their forest.

Lieven Devreese has experience with travelling and hiking in remote areas in Central Africa where one has to rely fully on local food supplies (see curriculum vitae). He masters the Lingala language spoken by virtually all Bateke people in this area. He is familiar with the distinctive calls, physical appearance and behaviour of Thollon's red colobus (*P. tholloni*) from south of the Congo River and previously recorded the Kiteke name for this species as *Voo* (most likely also used for *P. bouvieri*). Malbrant and Maclatchy (1949) cite *M'bomo* as the M'beti name for *P. bouvieri*..

b.3. Data collection

For each survey in the different sectors we will collect information on a daily basis such as time invested, weather conditions and areas covered using a Garmin GPS 60. Each day in the forest we will walk approximately six to eight hours at a slow pace along pre-existing animal or hunting paths, stopping regularly to look and listen for primates (reconnaissance walks; Walsh & White, 1999). Reconnaissance walks will be focussed on the early morning afternoons, as well as in late afternoon, when primates are typically more active. When detecting a group of *P. bouvieri*, we will try to approach them to make visual contact and collect general data such as habitat type, group size, group composition, presence of other primate species and diet composition. If possible, we will try to film and photograph individuals with a Canon Powershot SX50 HS camera to document possible variation in pelage. We will also try to record vocalisations in WAV format using a lightweight sound recorder (Edirol R09). All evidence indicates that vocal behaviour is one of the most evolutionarily stable characters among Old World monkeys and can be used to infer phylogenetic relationships.

Observations of other primate and non-primate species will also be noted. The literature mentions the following diurnal species in the area: *Colobus guereza occidentalis, Cercopithecus cephus cephus*, *Cercopithecus pogonias grayi*, *Cercopithecus neglectus*, *Cercopithecus nictitans nictitans*, *Cercocebus agilis*, *Lophocebus albigena*, *Pan troglodytes troglodytes* and *Gorilla gorilla gorilla*. As this is a preliminary study focussing on *P. bouvieri*, no attempt will be made to quantify primate densities. All signs of hunting encountered during reconnaissance walks will be noted (spent cartridges, hunting camps, shotguns heard, traps and snares).

We will opportunistically collect faecal samples and biopsies from hunter-killed specimens which could be used in a future molecular study to investigate the phylogenetic positioning of *P. bouvieri* among the other species in the genus. A hunter will never be given money or anything in return to avoid stimulating hunting practices.

c. Animal handling

There will be no close contact with primates. Faecal samples will only be collected non-invasively by searching the forest floor after a group has left the site. We will

wear gloves and follow a strict hygiene protocol to prevent zoonotic disease transmission.

d. Local professional development

We will make an appeal to a higher educated local assistant familiar with the region and culture, as well as experienced local hunters to join us in the forest in the search for primates. This study will stimulate the local people's interest for and knowledge of primates in the region, which may be of use for future conservation programmes.

e. Involvement of local people

In the villages we will depend on local people for lodging, cooking and food supplies. Local people will also gain additional income through several services ranging from transport in a canoe to bicycle repair.

f. Education and public information

Bouvier's red colobus is endemic for the Republic of Congo. At the end of each interview we will inform the local people about the uniqueness and conservation importance of this species for the region.

5. Post-project follow-up

a. Dissemination of results

The results of this first-ever study on the species will be published in a conservation-oriented and/or primatological journal, hopefully with encouraging results for the conservation of the species.

b. Possible post-project conservation action

Our preliminary results will possibly allow pinpointing potential areas of high conservation value for the species. However, more detailed data will be needed in the future (eg. on densities using standard sampling techniques).

c. Evaluation

We will evaluate the success (survey effort) of this study based on the number of interviews conducted, as well as the number of days spent in the forest and the area covered in different interfluves. Given that red colobus typically live in large social groups, vocalize frequently and spend much of their time in the upper canopy causing a lot of branch movement, the chance of encountering individuals of *P. bouvieri* should be high, if they are still present in the areas surveyed. The number of primates encountered, including *P. bouvieri*, will give an indication of the conservation importance of each area.

6. Timetable

Depending on the preparations of the expedition, we expect to start between January and March 2015 for a duration of maximum three months (the length of a regular visa). We count a maximum of two days in transit in Brazzaville at the beginning and end of the study.

Days 1 - 3	Preparations in Brazzaville and travel to Manga village
Days 4 - 5	Interviews and preparations in Manga village
Days 6 - 23	Surveys in sector 3 and hike and/or river transport to Loboko village
Days 24 - 25	Rest and preparations in Loboko village
Days 26 - 43	Surveys in sector 4 (forest hike and/or river searches)
Days 44 - 45	Rest and preparations in Loboko village
Days 46 - 63	Surveys in sector 2 and travel from Bekouélé to Oyo village
Days 64 - 65	Rest and preparations in Oyo village
Days 66 - 83	Surveys in sector 1 and travel back to N2 national road
Days 84 - 86	Travel back to Brazzaville and international flight

7. Budget

Lieven Devreese will undertake this expedition on a personal, voluntary basis to get more familiar with this kind of travelling and fieldwork in remote areas as a preparation for a possible future PhD project on phylogeny of primates in the Congo basin. Basic expedition equipment (gps, binoculars, camera, sound recorder, 1 tent, sleeping, travelling and hiking gear) as well as most of the necessary medicines are available from previous fieldwork.

The following expenses are fixed:

- international flight	$1.000
- visa (3 months)	$220
- travel and health insurance	$250
- public transport from and to Brazzaville (approximately 500km)	$100
- research permit	$150
- laminated photo prints	$20
- lodging and food in Brazzaville ($50 per day) x 4	$200
- additional tent for local assistant	$200
- malaria prophylaxis and treatment	$50
- small solar panel to charge gps, camera and headlamp batteries (eg. Goal Zero Guide 10 Plus Solar Kit)	$130

The following expenses depend on the needs and can thus only be approximated:

- local food (ca. $2 per person per day) x 90 days x 2 people	$360
- salary for local assistant (ca. $10 per day) x 90 days	$900
- salary for local guides (ca. $5 per day) x 60 days	$300
- permission from village chiefs to enter their forest (ca. $10) x 10	$100
- transportation on site (car, bicycles, motorcycles, canoe, gasoline, …)	$500
- lodging in villages (ca. $5 per night) x 30	$150
subtotal	$4630
unexpected costs (ca. 8%)	$370
total	**$5000**

This expedition will be carried out as an independent scientist. No affiliation or institutional support is available. The full amount of money will be needed for a three-month survey. A shorter duration will reduce costs, but given the fixed costs not significantly so. Because of the adventurous nature of the expedition in a very remote area of Central Africa, exact budget calculations are difficult to make. The expedition will be very basic and any luxury will be avoided to reduce costs. A possible budget surplus will be returned to funding organisations.

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Education

1. Bachelor in Biology 2005-2008 Ghent University, Belgium
distinction, always first session

- optional courses: terrestrial ecology, aquatic ecology
- Bachelor thesis: “Sea-drift dispersal of root-parasitic nematodes of *Elymus farctus.*”
- field course: “Social aspects of the grazing behaviour of horses and cows in a heterogeneous dune landscape.”

3. Master in Evolution and Behavioural Biology
2008-2011 University of Antwerp, Belgium
great distinction

- optional courses: primatology, mammalogy, ornithology, applied behavioural biology, ecological genetics, restoration ecology, field course ecology: Poland
- research project: ”Radio-tracking of juvenile middle spotted woodpeckers (*Dendrocopos medius*) in the Cantabrian Mountains in North Spain”
one month field work in 2009
- Master thesis: “Foraging strategy of agile mangabeys (*Cercocebus agilis*) exhibiting a permanent large grouping pattern at Bai Hokou, Central African Republic”
six months field work in 2010

Language skills

Dutch	mother tongue
French	fluently (speaking and writing)
English	fluently (speaking and writing)
Lingala	good knowledge
Sango	basic knowledge
German	basic knowledge

__Scientific accomplishments_____

- Devreese L, Gilbert CC (in prep). Phylogenetic relationships within the *Cercocebus* clade as indicated by craniodental morphology.
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- Devreese L (2010). Demographic structure, activity budget and ranging pattern of a unusually large group of agile mangabeys (*Cercocebus agilis*) at Bai Hokou, Central African republic. Oral presentation, Benelux Congress of Zoology.

__Work and field experience_____

- research assistant at LuiKotale Bonobo Project 10 months, 2013-2014 including a 4-day hike through unpopulated forest, a 4-day river trip and six days of travelling through remote villages to collect samples from different monkey species
- zoo keeper at Apenheul Primate Park 7 months, 2013
- training of trackers of the ngo Mbou-Mon-Tour in the Democratic Republic of Congo 6 weeks, 2013
- zoo keeper at Apenheul Primate Park 8 months, 2012
- Master thesis in the Dzanga-Ndoki National Park, Central African Republic 6 months, 2010
- Radio-tracking of woodpeckers in North Spain 1 month, 2009
- voluntary internships at La Vallée des Singes Primate Park, GaiaPark and Apenheul Primate park a total of 32 weeks between 2005 and 2008

11. Permission from appropriate governmental agencies

A visa can easily be acquired from the Brussels embassy. A research permit to collect faecal and tissue samples will be requested from the Ministry of Scientific Research and Technological Innovation located in Brazzaville. We are in contact with WCS-Congo to get more information about the procedure of acquiring a research permit.