“So, what did you find out this time around?” I often hear this question after I return to Europe from a research trip to Nigeria. The expectation is not unreasonable, given two permanent research stations maintained by the GPP since 2001: a recently renovated house at Gashaka village at the edge of the National Park and a larger assemblage of buildings ten kilometres away in the forests of Kwano.

However, the image of a lone researcher venturing to a little known place, soon to emerge with exciting scientific results, is a misconception. Firstly, the success of field projects is positively correlated with the time they are running – because much of what we want and need to know about habitat and wildlife ecology can only be answered through the collection of long-term data. By “long-term” I mean not weeks or months but years – or even decades. Secondly, much of today’s cutting-edge field research is combined with the subsequent analyses of data and biological samples in off-site facilities specialising in, e.g., virology, genetics, nutrition, geology, endocrinology or remote sensing.

A helpful way to understand the philosophy behind permanent field stations is to view them as out-door laboratories. As scientific director of such a ‘wild lab’, I need to ensure the uninterrupted collection of various baseline records, which entails maintenance of essential buildings and equipment as well as training and supervision of local field assistants. I also need to assess, facilitate and coordinate requests from short-term investigators who envisage pursuing a specific agenda during a limited stay in the field. These hopefuls include undergraduate, master and PhD students, postdocs and established academics as well as volunteers who yearn to gain experience in research and conservation-related activities. Such temporary visitors pay the project a modest “bench fee” that subsidises costs for accommodation and kitchen amenities, supplies of cooking gas, water and power as well as field assistant expertise.

These fees also feed into a linked scholarship scheme that fosters tertiary education of Nigerians in technical training institutes, community colleges and universities. Our project also aims to enable direct knowledge transfer. For this, Nigerian fieldworkers and those from the developed world work alongside each other, this introduces Africans to state-of-the-art methods not yet available to them.

So far, GPP field workers have come from two-dozen nations (Argentina, Austria, Brazil, Cameroon, Canada, France, Germany, Greece, Israel, Italy, Ivory Coast, Japan, Mexico, New Zealand, Nigeria, Portugal, Spain, Sweden, Switzerland, Taiwan, The Netherlands, United Kingdom, USA). They have been affiliated with 24 universities, 5 research institutes, 3 zoological societies and 4 conservation NGOs. Over 15 years, this flurry of research activity has resulted in 203 publications – that’s one per month! Overall, students produced 4 undergraduate and 36 master’s dissertations as well as almost 20 PhD theses (13 completed, 6 expecting completion). Output also encompasses 22 reports (“grey” publications), 13 popular writing pieces, 4 documentaries, 42 research abstracts, 2 books and – the major currency of scientific credibility – 60 articles in edited volumes and journals. One such publication just became the first winner of the “Folia Primatologica AH Schultz Best Paper Award”. The honoured paper by Alejandra Pascual-Garrido, Umaru Buba, George Nodza and me (“Obtaining raw material: Plants as tool sources for Nigerian chimpanzees”; Folia Primatol 83) illustrates how African and European researchers can fruitfully cooperate and achieve international recognition. (A summary of the published outputs can be found at the back of this report). The scientific yield of GPP, I dare to say, clearly ranks amongst the most
successful of any permanent field research station on the globe.

Such productivity is capacitated because individual pieces of research can rely on a background set of long-term data:

- **Weather.** Each day, field assistants jot down temperature, humidity and rainfall readings at Kwano and Gashaka. (Don’t be tempted to think that pen and paper are antiquated ways of doing this. It is not. Electronic climate loggers are quite literally blown away by severe storms during the rainy season – or incinerated by lightning.)

- **Habitat vegetation cover.** Straight-line transects over a total of 12 km at Kwano and Gashaka are visited twice per month, to monitor flowering and fruiting cycles as well as growth and survival of 1,500 taxonomically identified trees and associated vines. These transects constitute the longest running seasonal records for a mosaic habitat of Guinea-savannah and lowland rainforest anywhere in the world. They allow comparison with methodologically identical transects at other biomes (Ngel Nyaki / Nigeria; Luikotale / Democratic Republic of Congo).

Long-term data on climate and phenology allow us to pursue one of the main goals of GPP: to understand how environmental factors influence the structure and dynamics of animal societies. Within this paradigm, our focus has traditionally been on primate socio-ecology.

- **Monkey socioecology.** Two groups of olive baboons are fully habituated to human observers – meaning that observers can approach within a metre or so, without the monkeys being frightened. One of the troops – at Kwano – is completely wild feeding while the second one – at Gamgam River near Gashaka – supplements its diet via crop-raiding. Field assistants visit these troops according to a defined daily rota and record activity pattern, home-range use, group composition and demographic changes (pregnancies, miscarriages, birth, death, immigrations). These permanent records helped us to understand how matrilineal groups of mothers, daughters and granddaughters provide the structural backbone of their society. Moreover, these baboons survive at the edge of the species’ bio-geographical distribution, representing the most tree-dwelling population of otherwise rather terrestrial monkeys. Our investigations thus shed light not only on animal adaptability, but also on our own ancestry – as baboons serve as a model for how early humans survived. The baboon studies are coordinated by Dr. Caroline Ross, Roehampton University. A monograph
that sums up more than 15 years of field and lab-research is planned for 2017 (Caroline Ross / Volker Sommer, “Life at the Edge. The Baboons of Gashaka”).

- Ape socioecology. Communities of Nigeria-Cameroon chimpanzee inhabit the wider Kwano area. These apes represent the most endangered sub-species of the genus Pan and are rightly the park’s flagship animal, as they survive nowhere in larger numbers than here. Field assistants make regular contact with a study community, most commonly between April and June when fruit production is high, which attracts numerous apes to the same tree. Nevertheless, the chimpanzees are not habituated to human observers, and research relies mostly on indirect data. Ever more comprehensive data repositories exist for the assemblage of extractive wooden tools used by the apes, on the ecology of their invertebrate prey species (ants, bees), as well as on chimpanzee nutrition and pathogen load reconstructed from faecal samples. The Kwano community is also an integral part of the Pan Africa Great Ape Monitoring program led by the Max-Planck-Institute of Evolutionary Anthropology in Leipzig Germany. A vast amount of information on baseline ecology of the habitat stored at Leipzig awaits comparative analyses with respect to other chimpanzee, gorilla and bonobo populations.

- Wildlife abundance. In collaboration with the Max Planck Institute of Evolutionary Anthropology dozens of camera traps were employed throughout the Kwano forests as part of the Pan African Great Ape Surveillance project. This provided a fascinating insight into chimpanzee behaviour, in particular tool use. This work continues, given that the captured still- and video-images generate a riveting archive of the assemblage and activity pattern of numerous other types of large animals. These include antelopes, pigs, rodents and carnivores, many of which survive nowhere else in West Africa in such numbers. Finally, as promised, some results and questions that long-term research may generate. For example, our data on tree fruiting revealed surprising and peculiar 5-year cycles of high and low productivity. We are now keen to understand if certain trees synchronise their flowering, perhaps as a strategy to swamp seed predators with so much fruit, that pigs, antelopes or rodents can only destroy a fraction of the crop – which would increase the trees’ chances to reproduce. Long-term records on climate and availability of edible wild fruit also allowed us to better understand the levels of stress that baboons experience at the edge of their geographical distribution (MacLarnon et al. 2015, Gen. Comp. Endocrinol.). For this, we utilised hormone (glucocorticoid) measurements extracted from more than 1,000 baboon faecal samples that had been collected over a 6-year period. We identified considerable levels of thermoregulatory and nutritional stress for the wild-feeding baboons, while those that could supplement their diet via crop-raiding experienced only thermoregulatory stress. These findings lead us to hypothesise that baboons do not extend into even thicker, wetter forest, because they would be unable to maintain physiological stability within their normal reactive scope.

The phenology data may also allow us to get a better grip on the question of why chimpanzees sleep at certain sites. Like other great apes, every evening the chimpanzees build a new night-nest in the canopy. Primatologists still struggle to detect patterns behind this habit. Are certain trees selected because their architecture is more secure against attacks from leopards? Are certain species chosen where branches and leaves can be woven into a particularly comfortable sleeping platform? Is the nesting site related to thermoregulatory needs? Or does nest tree foliage protect against insect bites or other pathogens? To approach these questions, we have permanently marked 1,000 trees in which individual chimpanzees had constructed a nest. To detect selectivity, we will compare the species composition and architecture of nest trees against the baseline generated from the random transects. Moreover, the 1,000 nest trees will be re-visited by field assistants every other month for several years to come. In this way, we can see if certain trees are being used repeatedly. With this, we ultimately hope to understand if chimpanzee sleeping habits follow some underlying principal or pattern. Research, however, is not purely academic but has a tangible impact on deterring illegal activities in the core study areas and the parts of the park surveyed for biodiversity. Research also informs the conservation management strategies of National Park staff. Moreover, various students who gained first experiences at GGNP later chose a career in nature conservation. The intellectual challenges and outcomes of research are thus a persistent motivator to work towards the preservation of the truly wonderful wilderness that is GGNP.

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The 2014 Gangirwal Forest Expedition (16-28 Feb) continued previous surveys from 2005, 2006 and 2007 into little known areas surrounding the Gangirwal escarpment.

It consisted of 43 members and was enabled by the tireless stamina of 21 porters from Gashaka village and Serti town – spearheaded by the rightly famous cutlass-wielding pathfinder Mamuda Dabo, nicknamed “human GPS”. The National Park, which granted a permit for the expedition, was represented by 8 rangers, including members of the GGNP research unit and Officer Pepeh Kamaya. The Nigeria Montane Forest Project situated near GGNP at Ngel Nyaki and directed by Dr. Hazel Chapman (University of Canterbury, New Zealand) delegated four members, including doctoral student Ralph Adeyinka Adewoye. The scientific crew comprised of 9 individuals, including the organiser and leader of the expedition, Prof. Volker Sommer (UCL; scientific director of GBP); conservationist and wildlife expert Ian Redmond (Ape Alliance, UK); as well as George Nodza, doctoral student in botany at the University of Lagos. Chester Zoo was represented by Dr Sonya Hill (primate expert) and John Fletcher (Horticulture and Botany). The construction firm Julius-Berger-Nigeria sent two of their IT-experts, Wolfgang Krause and Malte Schmalfeldt. Botanical expertise was provided by Lee Davies and Felix Merkinger of the Wet Tropics of Africa herbarium team of RBGK.

Top: The Gangirwal expedition team 2014
Bottom: The Montane forests of the Gangirwal escarpment
The Wet Tropics of Africa (WTA) team in the herbarium at the Royal Botanical Gardens, Kew, took part in fieldwork in GGNP in early 2014.

At the heart of this exercise was a two-week expedition through the mountainous southern sector, including an ascent to Gangirwal: almost 2500m to climb, claiming the title of West Africa’s highest mountain. The expedition snaked up through densely forested tributaries and descended through some heavily forested and steeply framed high-elevation valleys that quite probably had not previously been visited by human beings.

The long-term objective of Kew’s involvement in GGNP is to assist in characterising the vegetation types of Nigeria’s largest national park by enumerating the species and plant composition – and hopefully one day to produce a comprehensive catalogue of the sanctuary’s flora. Such ambition is combined with the intention to develop a botanical capacity building programme. For this, it will be necessary to identify rangers who are keen and capable to engage in plant collection. Accumulating such material will enable further study and conservation measures for those plants that are rare (Red Data Species).

As a first step, Kew staff members Lee Davies and Felix Merklinger trained various rangers in the basics of making herbarium specimens. It is hoped that through further collaboration with partners in Nigeria, a recognised centre for plant diversity studies might develop.

This first visit included brief surveys of some of the iconic vegetation types of GGNP.

Guinea Savannah - a type of wooded grassland – covers much of the lower lying areas of the southern sector, and is comprised of plants that can tolerate fire or recover rapidly after burning. A particularly interesting pyrophytic species from the daisy family (Compositae) was spotted at several locations: the Vernonia chthonoccephala. This plant emerges from the ground shortly after fires have swept through. It produces small, purple inflorescences at ground level before pushing leaves in response to the rains later in the year.

Lowland seasonal hardwood forest is found as a mosaic with Guinea Savannah. This type of vegetation cover only survives along water courses and is continuously threatened by fire and grazing. The repeated burning results in the understorey of these forests slowly disappearing because the plants here are not adapted to fire. As a result, larger trees are often not protected by surrounding vegetation and burn themselves. Losing the understorey also means that the vegetation dries out much quicker during the dry season. Notable specimens are trees of the Sapindaceae and Leguminosae families as well as some Rubiaceae and Pandanus candelabrum.

The montane forest at elevations of 1200m and above is the least known vegetation type in the park. Very high humidity for most of the year promotes a healthy growth of mosses and lichens on the trees that gives the forest an almost mystical aura. Growth also becomes somewhat stunted, leading to a more dense vegetation cover. In this “jungle” one can still find a myriad of little known species, for example members of the Thymelaeaceae (Daphne) family (e.g. Dicranolepis).

Numerous watercourses provide a home to members of an enigmatic family of aquatic angiosperms – i.e., plants that manage to produce flowers despite often submerged conditions. These Podostemaceae are specialised to grow in fast flowing rapids of fresh water streams. Species are often very restricted and sometimes even known only from one river. Tributaries of the Gam Gam River, for example, saw an abundance of Ledermanniella, Letestuella and the more widespread genus Tristicha. Pollination in this family is not well understood, but is often assumed to take place by wind. However, during this expedition, it was observed that Tristicha trifaria was pollinated by Apis mellifera – the honeybee. That hitherto unknown interaction was photographed and filmed, and the specific type of pollinating insect identified by a specialist at the Natural History Museum in London.