

Range Extension, Imminent Threats and Conservation Options for Two Endangered Primates: The Tana River Red Colobus *Procolobus rufomitrat*^{us} *rufomitrat* (Peters, 1879) and the Tana River Mangabey *Cercocebus gal*^{eritus} (Peters, 1879) in the Lower Tana Floodplain and Delta, Kenya

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Abstract: Two Endangered primate taxa, the Tana River red colobus (population estimate less than 1200) and the Tana River mangabey (population estimate less than 2000), are only known from a restricted area of patchy riverine forest in the floodplain of the Lower Tana River in Kenya. This paper describes the discovery of several groups of both species further south, in the Tana Delta, which for the Tana River red colobus represents a marginal extension of its range, and for the Tana River mangabey a substantial extension of the known range. Both the extent and the quality of their previously known habitat continue to decline and the newly discovered sites are under severe threat from forest over-exploitation, attempts to redirect the river course away from the forest patches, expansion of large-scale irrigation both locally and upstream for food and for biofuel production which may affect river flows, and especially by the planned construction of a very large hydropower dam several hundred km upstream at Grand Falls. This sixth dam in the Tana River cascade may put an end to the natural flooding regime that has sustained the riverine forest where the primates reside. In fact, unless the new dam is designed and used to produce large managed flood releases that mimic the natural flooding regime, the entire high biodiversity floodplain and delta, its ecosystems, and the livelihoods dependent on them are in jeopardy. Locally, there is a need to come up with a common vision for the future of the delta and to implement proposed conservation measures.

Key words: threatened primates, riverine forest, floodplains, large-scale irrigation, biofuels, hydropower dam, managed flood releases

Résumé: Le colobe bai du Tana (population estimée à moins de 1200 individus) et le mangabey du Tana (population estimée à moins de 2000 individus) sont des taxons de primates en danger d'extinction et ne sont connus que d'une aire restreinte constituée de lambeaux de ripisylve dans la plaine inondable du Bas-Tana au Kenya. L'article décrit la découverte de plusieurs groupes des deux espèces plus au Sud, dans le Delta du Tana, ce qui, pour le colobe bai du Tana représente une extension marginale de l'aire de répartition connue mais pour le mangabey du Tana il s'agit d'une extension considérable. L'étendue et la qualité de leur habitat connu auparavant continuent à se détériorer et les sites nouvellement découverts sont menacés par la surexploitation forestière, par des tentatives de rediriger le fleuve l'éloignant ainsi des ripisylves, par l'expansion de l'agriculture irriguée à grande échelle sur les sites et en amont (production de nourriture et d'agrocarburants) mettant en péril les débits du fleuve et surtout par la construction d'un très grand barrage hydro-électrique à Grand Falls, plusieurs centaines de km en amont. Ce sixième barrage sur la cascade du Tana peut mettre fin au régime naturel des crues qui a maintenu les ripisylves où résident les primates. Afin de maintenir la riche biodiversité des plaines inondables et du delta, leurs écosystèmes et les modes de vie qui en dépendent, le barrage devrait être conçu et géré de façon à ce que des crues artificielles suffisamment grandes et qui imitent le régime des crues naturelles soient pratiquées. A l'échelle locale il est nécessaire d'élaborer une vision commune de l'avenir du delta et de mettre en œuvre des mesures de conservation proposées.

Mots clé: primates menacés, ripisylve, plaines inondables, irrigation à grande échelle, agrocarburants, barrage hydro-électrique, crues artificielles

INTRODUCTION

The Tana River red colobus *Procolobus rufomitratus* (Peters, 1879) (Figure 1) and the Tana River mangabey *Cercocebus galeritus* (Peters, 1879) (Figure 2) are two threatened primate taxa endemic to a few dozen patches of riverine forest spread across some 60 km² of the Lower Tana River in Kenya (de Jong & Butynski, 2009), roughly between the northern border of the recently (January 2007) degazetted Tana River Primate National Reserve (TRPNR) and the Garsen to Witu road (Figure 3). The Tana River mangabey also has been recorded in one forest patch north of the TRPNR (Nkanjonja 1°45'05" S, 40°07'14" E), and a few records exist for both taxa from forest patches situated less than 5 km south of this road (Karere *et al.*, 2004), all of them situated on the eastern bank of the Matomba branch of the Tana River. Population estimates for both species vary between authors, but are between 800 and 1200 for *P. r. rufomitratus* and between 1200 and 2000 for *C. galeritus* (Butynski & Mwangi, 1995; Karere *et al.*, 2004). Their preferred habitat, the riverine forest of the Tana River, is in rapid decline through a combination of factors (Hamerlynck *et al.*, 2010), including reduced flooding (Maingi & Marsh, 2002), loss of forest cover (Moinde-Fockler *et al.*, 2007) and habitat quality degradation (Luke *et al.*, 2005).



Figure 1. Tana River red colobus *Procolobus rufomitratus*. Photograph by O. Hamerlynck.



Figure 2. Tana River mangabey *Cercocebus galeritus*. Photograph courtesy of Julie Pouliquen.

The taxonomy of red colobus is complex because few taxa are sympatric and because it is mostly based on coat-colour variation, a criterion that has considerable intra-taxon variation (Struhsaker, 2010). As a species, *Procolobus rufomitratus* is now considered of Least Concern, mainly because of its widespread occurrence in the Congo Basin. The quite characteristic, restricted-range Tana subspecies *P. r. rufomitratus*, however, is listed as Endangered, and is considered a full species by some experts (e.g., Mbora & Butynski, 2009).

Previous conservation measures, such as the creation of the 17,000 ha Tana River Primate National Reserve at the northern end of its known range and which was recently (2007) degazetted (Mbora & Butynski, 2009), have been largely ineffectual in spite of a \$6.7 million World Bank GEF project (1996 to 2001). For example, Moinde-Fockler *et al.* (2007) estimate that over a period of 21 years (1979-2000), forest cover loss amounted to 29% inside, and 38% outside, of the Reserve. In addition, the most recent population estimates of both primates, as reported by Karere *et al.* (2004), refer to a census conducted between January and March 2001; i.e., over 10 years ago and therefore unlikely to be accurate.

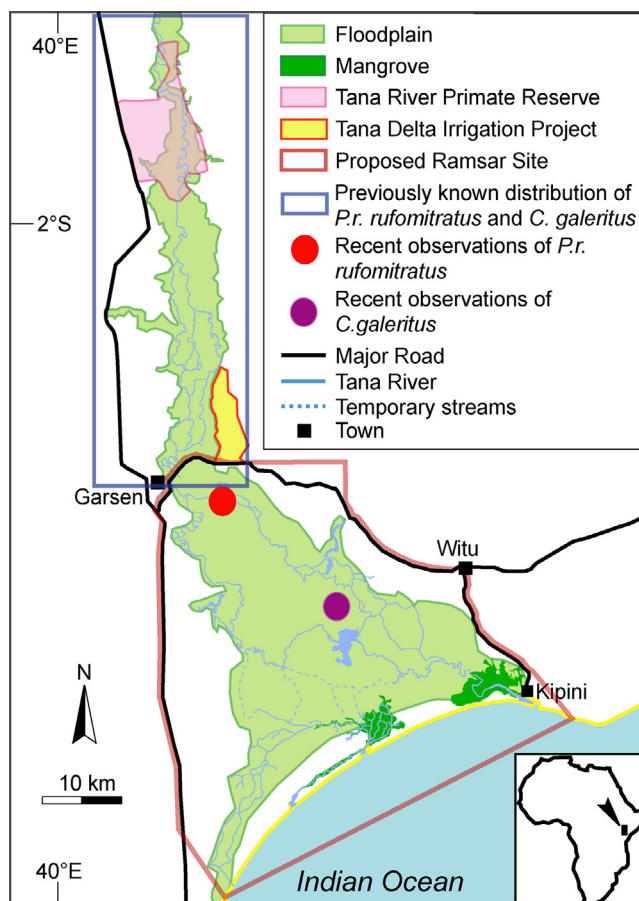


Figure 3. Map of the Lower Tana and the Tana Delta showing main habitat types, the previously known range of both primate taxa, the recent observation sites outside of the known range, and the extent of conservation areas.

OBSERVATIONS

Recent exploration of the Tana Delta (roughly between S 2°19.31' E 40°06.61' and S 2°32.72' E 40°33.99'), done within the framework of its proposed listing as a wetland of international importance under the Ramsar Convention (see proposed boundaries in Hamerlynck *et al.*, 2010), has shown that high biodiversity riverine forest extends quite far south into the delta and that these forests accommodate the two threatened primates whose conservation was a key objective for the creation of the Tana River Primate National Reserve.

The presence of Tana River red colobus *P. r. rufomitrat* was confirmed in the Onkolde area centred around an approximately 7 hectare patch of 20-25 m high “primary” forest (S 2°18.71' E 40°11.07') whose canopy is dominated by *Oxystigma msoo* (Vulnerable B1+2b). The other main canopy tree species present is *Diospyros mespiliformis*, though many of these have been cut for planks over the last few years, with some very recent felling of large trees using chainsaws observed during our first visit in April 2009. Smaller tree species in the “high” forest are: *Polysphaeria multiflora*, *Drypetes natalensis* var *leiogyna* (VU B1+2b), *Garcinia livingstonei*, *Ekebergia capensis*, *Kigelia africana*, *Cordia goetzei*, *Sorindeia madagascariensis*, *Majidea zanguebarica*, *Cola pseudoclavata*, *Lepisanthes senegalensis*, *Rinorea elliptica*, *Blighia unijugata* and *Phoenix reclinata*. Common lianes are *Culcasia orientalis*, *Flagellaria guineensis*, *Iodes usambaricensis*, *Combretum paniculatum*, *Agelaea pentagyna*, *Paullinia pinnata*, *Keetia zanzibarica* and *Salacia* spp. The edge of this forest grades into palm woodland/secondary forest of *Borassus aethiopicum* and *Hyphaene compressa*, *Spirostachys venenifera* with some *Acacia zanzibarica* and the invasive *Prosopis juliflora*. With the surrounding 10-15 m high “secondary” forest, the total area where the *P. r. rufomitrat* have been observed covers about 60 hectares.

Over the past two years, four visits were conducted to the Onkolde forest and *P. r. rufomitrat* groups were observed on each occasion:

- One group of 6 individuals in the secondary forest north of the embankment and one group of 8 individuals in the “high” forest in April 2009 (Luke & Hamerlynck, 2009)
- Three small groups totalling 10 individuals in the “high” forest in August 2010
- Two groups in the low secondary forest to the north and, for the first time, also to the south of the embankment in January 2011. During this visit no *P. r. rufomitrat* were encountered in the “high” forest dominated by *Oxystigma msoo*, where they were seen in August 2010 and where most of the canopy trees were now leafless.
- One group of 12 individuals (including 2 infants) in the “high” forest in May 2011. There was some new leaf in the canopy trees of the forest but still much less dense than in April 2009. Video footage was obtained of the group feeding and moving through the forest.

The Onkolde forest, where the *P. r. rufomitrat* were observed, is situated on the west bank of the Matomba branch of the Tana River and stretches out on both sides of an embankment constructed by the Tana and Athi Rivers Development Authority (TARDA) in an attempt to close off the eastern (“Matomba”) branch. It is likely that such attempts will intensify in the future, on the one hand to force the river back into its western branch where the main populations of sedentary Pokomo farmers are lacking water, and on the other to expand embanked irrigated land in the area. Currently, both the high and low forest are intensively used for the collection of woody and non-woody forest products, including the cutting of poles and a near systematic felling of large *Diospyros mespiliformis* from the “high” forest using chainsaws.

A first group of at least a dozen Tana River mangabey *C. galeritus* was observed in August 2010 in a riverine forest dominated by *Barringtonia racemosa* at S 2°24.20' E 40°18.15', some 15 km to the southeast of Onkolde forest, almost in the centre of the Tana Delta, halfway between Garsen and the river mouth at Kipini, locally known as “Masewa forest”. In January 2011, what are thought to be 2 (or 3?) groups of possibly 20 to 25 individuals each were encountered a few km further to the southeast in strips of riverine forest around S 2° 24.26' E 40°19.45' (just to the northwest of what is locally known as the “Shetani forest”). At that time they also were observed feeding in the grasslands/thorn bush surrounding the riverine forest.

Around the *Barringtonia* strip, which is in general only 10 to 20 m wide, is a 50 to 200 m wide typical Tana riverine forest with characteristic tree species *Phoenix reclinata*, *Ficus sycomorus*, *Mimusops obtusifolia*, *Trichilia emetica*, *Ekebergia capensis*, *Combretum schumannii*, *Acacia roivumae*, *Diospyros mespiliformis*, *Sorindeia madagascariensis*, *Synsepalum msolo*, *Cordyla africana* and *Garcinia livingstonei*. The understory consists of *Rinorea elliptica*, *Oncoba spinosa*, *Haplocoelum inopleum*, *Erythroxylum fischeri*, and *Alangium salviifolium*. The drier edges contain species such as *Dobera loranthifolia*, *Lecaniodiscus fraxinifolius*, *Lannea schweinfurthii* and *Acacia robusta*. A number of threatened, Red List species are found in this forest: *Angylocalyx braunii*, *Drypetes natalensis* var. *leiogyna*, *Mildbraedia carpinifolia* (all Vulnerable B1+2b), and a single *Oxystigma msoo* (Vulnerable B1+2b, but soon to be listed as Endangered B2ab).

From an aerial survey on 17 January 2011, it can be concluded that a thin (between approximately 50 and 200 m wide) but continuous strip of riverine forest exists between the 2 locations where the *C. galeritus* were observed (Figure



Figure 4. Thin riverine forest along minor branch of the Tana River, the habitat in the delta that is used by the Tana mangabey. Photograph by O. Hamerlynck.

4). This riverine strip is situated along a minor branch of the Tana River which had some flow in April 2009 but held only stagnant water in January 2011, which could be rather worrying as loss of flow may negatively affect groundwater levels and therefore the survival of the forest. Unfortunately, there are no recent river level data from the Lower Tana that would allow us to compare water levels in April 2009 and January 2011 to evaluate if the drying-out in 2011 is simply related to a lower flow in the main river or an indication of a shift of the main flow out of the forested channel and into grassy floodplain channels. A new stageboard was installed by IRD (French Institute of Research for Development) and WRMA (Water Resources Management Authority) at Idsowe bridge in October 2011 (RGS 4G02) and should allow a better understanding of the river dynamics in the area in the near future.

As the crow flies, the area where *C. galeritus* have been encountered is only about 3 km long but, because of the meandering nature of the river, the forest strip itself is in reality probably about twice as long. Assuming an average width of 100 m, this implies about 60 ha of riverine forest. Possibly suitable strips exist to the north and the south of the area where the *C. galeritus* have currently been seen. Though the forest seems to be of good quality, recent fires have destroyed part of its western edge and selective tree-felling for canoe-building was found in several places. Other relevant species seen in the forest include Pousargues's white-collared Monkey *Cercopithecus mitis albotorquatus*, Ibean yellow baboon *Papio cynocephalus ibeanus*, African clawless otter *Aonyx capensis*, hippopotamus *Hippopotamus amphibius* (Vulnerable A4cd), African buffalo *Syncerus caffer*, bushbuck *Tragelaphus scriptus*, waterbuck *Kobus*

ellipsiprymnus, African finfoot *Podica senegalensis*, southern banded snake eagle *Circaetus fasciolatus* (Near Threatened), crested guineafowl *Guttera pucherani*, and dark-backed weaver *Ploceus bicolor*. Only some old bones and teeth of African elephant *Loxodonta africana* were encountered, as well as a skull of a desert warthog *Phacochoerus aethiopicus*. Though the habitat looks suitable for *P. r. rufomitratatus*, none have been encountered so far. There might be too large a gap in the riverine forest between Onkolde and the more southeasterly gallery forest between Masewa and Shetani, but this section still needs to be explored.

DISCUSSION

Both the Onkolde forest and the gallery forest where *C. galeritus* was found have the comparative advantage of being in the vicinity of the eastern Matomba branch of the Tana River, an area dominated by grasslands exploited by the Orma pastoralists. The Orma do use the forests for the collection of various woody and non-woody products, but in general, do not convert the vegetation for agricultural purposes. The Orma do increasingly practice rainfed agriculture but are mostly doing this on the higher ground several km away from the river. These practices stand in sharp contrast to those of the agricultural Pokomo communities that dominate around the western Oda branch. These sedentary farmers increasingly practice agriculture all the way down to the river bank, thus entirely eliminating the gallery forest or replacing it with mango trees *Mangifera indica*. Grassland fires, presumably lit to regenerate the pasture, do affect the outer edges of the forest strips.

Still, the local communities are not the main threat to the survival of the primates. Locally, the main threat is the planned conversion of the entire central part of the delta, some 40,000 ha, to irrigated sugarcane by the Tana and Athi Rivers Development Authority (TARDA) in collaboration with Mumias Sugar Ltd.. In spite of strong criticism from a wide range of stakeholders, with regard to both the procedure and the content of the Environmental Impact Assessment (conducted by HVA International, a Dutch company that specializes in agro-industrial development consulting with no credentials in EIA), the EIA was approved by the National Environment Management Authority (NEMA). Local communities and environmental NGOs are still challenging the decision through the courts (Duvail *et al.*, 2010). Another threat is posed by the repeated attempts to redirect the main river to its more western course where the Pokomo farmers are confronted with a lack of water. So far these attempts have been restricted to the expensive but ineffective digging of channels and building of embankments without using detailed topographical information. A well-planned and executed intervention with a complete dredging of the old channel might succeed, however, in drying out the riverine forests in the eastern floodplains currently supplied through the Matomba branch.

Indirectly, the area may be affected by the establishment of extensive *Jatropha* biofuel farms by Bedford Biofuels (Canada, 50,000 ha) and G4 Industries (UK, 28,000 ha) that will reduce the grazing land on the terraces surrounding the delta and thus potentially further increase pastoralist pressure on the central wetlands (Duvail *et al.*, 2012). In addition, Mat International is claiming more than 30,000 ha slightly upstream of the delta for sugarcane. In the past, hundreds of millions of US\$ have been invested to equip 35,000 ha for irrigation in the Lower Tana floodplains but all these schemes have failed miserably (Hamerlynck *et al.*, 2010). Currently, a small part of the Tana Delta Irrigation Project (TDIP) is being rehabilitated by TARDA for rice cultivation, but this seems to be a strategy for the reaffirmation of locally contested land rights, rather than a genuine and viable development endeavour as none of the structural deficiencies that led to its initial failure (Lebrun *et al.*, 2010) seem to have been addressed. Still, should these new projects and rehabilitations become operational (even for restricted time periods until government subsidies or donor funds run out again), they will result in increased water off-take which may reduce the flows necessary to the survival of the riverine forests in the delta.

The Lower Tana riverine forests and floodplains, their biodiversity and their associated livelihoods have already suffered from the reduction in peak flow that resulted from the construction of a 5 dam cascade (Masinga, Kamburu,

Kindaruma, Gitaru and Kiambere) some 300 km upstream of the delta (Maingi & Marsh, 2002). Studies currently are underway for the construction of an even larger storage reservoir (capable of storing nearly two times the annual flow of the Tana River) for a multipurpose dam a few km downstream of Grand Falls (S 0°16.15' E 38°0.08), some 50 km upstream of Meru National Park. In addition to its use to produce firm power, especially during the dry season when the other dams suffer from inadequate storage capacity, the 700 MW Grand High Falls dam also would be used to provide peak power to cope with increased electricity demand at sunset. This would imply very frequent peak releases that would need to be balanced by a secondary dam capable of storing at least a month of flow either at Adamson's Falls in Kora National Park or further downstream at Usueni. A third gated barrage would then be constructed at Nanigi, some 45 km downstream of Garissa, to abstract water for between 75,000 and 125,000 ha of irrigated land. This, in spite of the fact that, after decades and hundreds of millions of US\$ invested into irrigation schemes in the Tana River floodplains in 2009, only 700 ha out of over 35,000 ha developed were cultivated (Ngumbi *et al.*, 2009). Under this scenario it is highly unlikely that managed flood releases that would be sufficiently large to maintain the downstream floodplains and deltaic ecosystems, as well as their associated biodiversity and livelihoods, would be practiced or even be feasible. Conservation and even restoration of the pre-dam flood characteristics of the Tana River is therefore the key management issue.

At the local level, it would be necessary to establish a common vision of the future of the delta and engage the stakeholders into a participatory joint management planning exercise especially with regard to the partitioning of the water under various types of floods. The approach should be bottom-up (Borrini-Feyerabend *et al.*, 2004) rather than the technocratic and top-down approach that has been characteristic of projects in the basin. Some community and village-based processes are underway in the delta but they are hampered by the lack of a common vision and the absence of a comprehensive hydrological model that could outline what is possible. Every village and stakeholder group wants more water, but without detailed knowledge of what is actually available, the process is bound to fail. Implementation would include reconnecting the forest patches, as proposed for the TDIP area by Luke *et al.* (2005), as well as creating village woodlots for the production of poles, etc. Intermediate technology solutions also would need to be researched and implemented to replace canoes (a local fibreglass canoe workshop?). Though the rates of riverine forest degradation and conversion have not yet been established, to our eyes there simply are not enough large trees left in the riverine forest strips to allow harvesting to continue unchecked.

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Tana River mangabey Cercocebus galeritus. Photograph courtesy of Julie Pouliquen.
