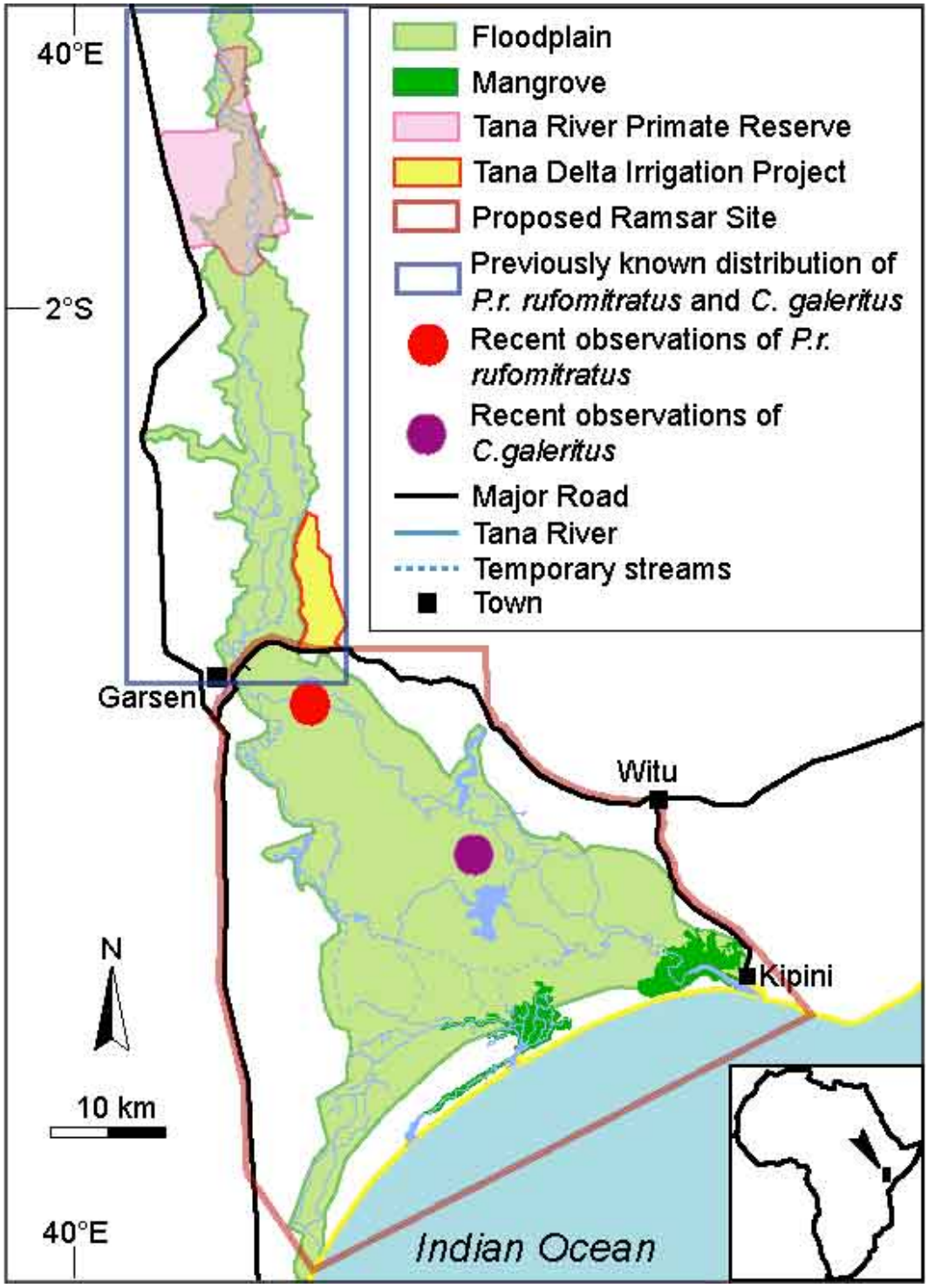
Range Extension, Imminent Threats and Conservation Options for Two Endangered Primates: the Tana River Red Colobus *Procolobus rufomitratus rufomitratus* (Peters, 1879) and the Tana River Mangabey *Cercocebus galeritus* (Peters, 1879) in the Lower Tana Floodplain and Delta, Kenya

O. Hamerlynck[1], Q.Luke[2], T.M. Nyange[2], S. Duvail[3] & C. Leauthaud[4]

[1]Centre for Ecology and Hydrology, Wallingford, Crowmarsh Gifford, United Kingdom
olivier.hamerlynck@gmail.com
[2]National Museums of Kenya, Nairobi, Kenya
[3]IRD, UMR 208 PALOC, Paris, France and IFRA, Nairobi, Kenya
[4]IRD, UMR INRA-IRD-SupAgro, Montpellier and UMR 208 PALOC, Paris, France

INTRODUCTION

The Tana River Red Colobus *Procolobus rufomitratus rufomitratus* (Peters, 1879) and the Tana River Mangabey *Cercocebus galeritus* (Peters, 1879) are two endangered primate taxa endemic to a few dozen patches of riverine forest spread across some 60 km² of the Lower Tana River in Kenya (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 (Fig.1). The Tana River Mangabey was also 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).



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, mainly because of its widespread occurrence in the Congo Basin, *Procolobus rufomitratus* is now considered of Least Concern. However, its restricted range and quite characteristic Tana subspecies *P.r. rufomitratus* is still considered endangered and considered a full species by e.g. Mbora & Butynski (2009).

Previous conservation measures, such as the creation of the 17,000 ha Tana River Primate National Reserve (TRPNR) 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 M$ 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 may therefore no longer be accurate.

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 (TRPNR).

The presence of Tana River Red Colobus *P.r. rufomitratus* was confirmed in the Onkolde area centred around an approximately 7 hectare patch of 20-25m high "primary" forest (S2°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 madagascarensis, 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 aethiopium* 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. rufomitratus* have been observed covers about 60 hectares.

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

- 1 group of 6 individuals in the secondary forest north of the embankment and 1 group of 8 individuals in the "high" forest in April 2009 (Luke & Hamerlynck, 2009)
- 3 small groups totalling 10 individuals in the "high" forest in August 2010

- 2 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. rufomitratus* 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.
- 1 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. rufomitratus* 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 mesipiliformis* 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 S2° 24.26' E 40°19.45' (just to the northwest of what is locally known as the "Shetani forest"). At that time they were also 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 200m wide typical Tana riverine forest with characteristic tree species *Phoenix reclinata, Ficus sycomorus, Mimusops obtusifolia, Trichilia emetica, Ekebergia capensis, Combretum schumannii, Acacia rovumae, 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 (Photograph 1) 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. 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 had 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. rufomitratus* 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 specialises 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. However, a well-planned and executed intervention with a complete dredging of the old channel might succeed 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. 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). Currently studies are under way 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 would also 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 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.

Locally 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 of 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 would also 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 are simply not enough large trees left in the riverine forest strips to allow harvesting to continue unchecked.

ACKNOWLEDGEMENT

The field trips to the Tana delta were supported by the "Eaux et Territoires" project funded by the French Ministry of the Environment through the "Institut de Recherche pour le Développement" (IRD) in partnership with Kenya Wildlife Service (KWS) and National Museums of Kenya (NMK). The manuscript greatly benefited from suggestions made by an anonymous reviewer.

LITERATURE CITED

Butynski, T.M. & G. Mwangi. 1995. Census of Kenya's endangered red colobus and crested mangabey. *African Primates* 1: 8-10.

Borrini-Feyerabend, G., Pimbert, M., Farvar, T., Kothari, A. & Renard, Y. 2004. Sharing Power: Learning by Doing in Co-Management throughout the World. IIED and IUCN/CEESP/CMWG, Cenesta, Tehran.
http://www.iucn.org/about/union/commissions/ceesp/ceesp_publications/sharing_power.cfm

Duvail, S., C. Médard, J.-L. Paul. 2010. Les communautés locales face aux grands projets d'aménagement des zones humides côtières en Afrique de l'Est. *Politique Africaine* 117 : 149-172.

Hamerlynck, O., J. Nyunja, Q. Luke, D. Nyingi, D. Lebrun & S. Duvail 2010. The communal forest, wetland, rangeland and agricultural landscape mosaics of the Lower Tana, Kenya, a socio-ecological entity in peril. In *Sustainable use of biological diversity in socioecological production landscapes*. : C. Belair, K. Ichikawa, B.Y. L. Wong, and K.J. Mulongoy, eds. Secretariat of the Convention on Biological Diversity, Technical Series no. 52. Montreal. Pp. 54-62.
http://www.wetlands.org/Portals/0/Hamerlynck%20et%20al%202010%20CBD%20Satoyama%20illus.pdf

Jong Y.A de & T.M. Butynski. 2009. Primate Biogeography, Diversity, Taxonomy and Conservation of the Coastal Forests of Kenya. Unpublished Report to Conservation International's Critical Ecosystem Partnership Fund.
www.cepf.net/Documents/Final_dejongbutynski_kenyaprimates.pdf

Karere, G.M., N.O. Oguge, J. Kirathe, P.K. Muoria, N.N. Moinde & M.A. Suleman. 2004. Population sizes and distribution of primates in the Lower Tana River Forests, Kenya. *International Journal of Primatology* 25(2): 351-365.

Lebrun, D., O. Hamerlynck, S. Duvail & J. Nyunja. 2010. The importance of flexibility: an analysis of the large-scale Tana Delta irrigation project in Kenya, implemented under an estate system. In *Shared water, shared opportunities. Hydropolitics in East Africa*. B. Calas & C.A. Mumma Martinon, eds. IFRA and Hekima College, Nairobi, Kenya. Pp. 261-282.

Luke, Q., R. Hatfield & P. Cunneyworth. 2005. Rehabilitation of the Tana Delta Irrigation Project, Kenya. An environmental assessment. Unpublished Report to Conservation International's Critical Ecosystem Partnership Fund, 102 pp. + annexes.
www.cepf.net/Documents/Final.TDIP_Environmental_Assessment.pdf

Luke, Q. & O. Hamerlynck. 2009. A population of the Tana River Red Colobus *Procolobus rufomitratus rufomitratus* in the Tana Delta, Kenya. *Primate Tidings* 21:12-14.

Maingi, J.K. & S.F. Marsh 2002. Quantifying hydrologic impacts following dam construction along the Tana River, Kenya. Journal of Arid Environments 50: 53-79.

Mbora, D.N.M & Butynski T.M. 2009. Tana River Red Colobus. In *Primates in Peril: The World's 25 Most Endangered Primates 2008–2010*. R.A. Mittermeier, J. Wallis, A.B.

Rylands, J.U. Ganzhorn, J.F. Oates, E.A. Williamson, E. Palacios, E.W. Heymann, M.C.M. Kierulff, Long Yongcheng, J. Supriatna, C. Roos, S. Walker, L. Cortés-Ortiz & C. Schwitzer, eds. IUCN/SSC Primate Specialist Group (PSG), International Primatological Society (IPS), and Conservation International (CI), Arlington, VA. 84 pp.

http://www.primate-sg.org/PDF/Primates.in.Peril.2008-2010.pdf

Moinde-Fockler, N.N., N.O. Oguge, G.M. Karere, D. Otina & M.A. Suleman. 2007. Human and natural impacts on forests along lower Tana river, Kenya: implications towards conservation and management of endemic primate species and their habitat. *Biodiversity and Conservation* 16: 1161-1173.

Ngumbi, R., M. Okonji, B. Sossi & J. Wachira. 2009. Tana River District 2009 Long rains Assessment. World Food Programme, 17 pp.

Struhsaker, T.T. 2010. *The Red Colobus monkeys. Variation in demography, behavior, and ecology of endangered species*. Oxford University Press, Oxford.