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Some conservation aspects of papyrus endemic passerines around Lake Victoria, Kenya

Alfred O. Owino and Joseph O. Oyugi

The conservation of papyrus *Cyperus papyrus* swamps is a neglected issue in Kenya. These swamps occur in patches. Whilst the best patches of intact habitat still occur in the Lake Victoria basin (where they previously formed a continuous fringe along the shoreline), this landscape has been severely disrupted and fragmented in recent years (Kairu 2001, Byaruhanga *et al*. 2001). Extensive, intact patches of papyrus today only occur at the mouths of the major rivers and associated small lakes (Bennun & Njoroge 1999). Papyrus swamps, like many other wetlands, have very important hydrological, ecological and economic functions, but their avifauna is not particularly rich compared to other habitats. Nonetheless, the papyrus avifauna includes an impressive number of specialists including Papyrus Gonolek *Laniarius mufumbiri*, which belongs to the bush-shrikes (Malaconotidae), Carruthers' Cisticola *Cisticola carruthersi* (member of widespread genus Cisticola), White-winged Warbler *Bradypterus carpalis*, Greater Swamp Warbler *Acrocephalus rufescens*, Papyrus Yellow Warbler *Chloropeta gracilirostris* among others (Leisler & Winkler 2001). Papyrus Yellow Warbler, the globally Near-threatened Papyrus Gonolek and several other species are of regional significance (BirdLife International 2004, Bennun & Njoroge 1996). The papyrus swamps in the Lake Victoria basin are therefore of great significance, not only for conservation of these passerines but also to other fauna.

Generally, the papyrus-endemic birds are poorly studied and very little is known about their biology (Fanshawe & Bennun 1991). Previous surveys by Maclean *et al*. (2003) have shown that papyrus-specialist bird species are not evenly distributed in the Kenyan sector of Lake Victoria. Various studies have documented the effects of particular disturbance agents on papyrus specialist birds and found fewer specialist birds in disturbed papyrus stands. For instance, Papyrus Yellow Warbler is absent from the more extensive papyrus stands around the northern and western shores of Lake Victoria (BirdLife International 2004). This lack of adequate knowledge is a concern, since the habitats they depend on are under severe anthropogenic pressures. Furthermore, insufficient information hinders our ability to distinguish which papyrus swamp fragments in the Kenyan sector of Lake Victoria are of priority concern for conservation action, based on the levels of threats and the species present.

This study had three key objectives; (i) to assess the status and distribution of papyrus endemic birds in relation to papyrus habitat conditions; (ii) using standardized point counts, estimate their population sizes; and (iii) undertake general assessment of qualities of papyrus fragments with respect to the long-term survival of the species.

Study areas and methods

The three papyrus swamps, Dunga (01°10'S, 34°47'E), Koguta (01°17'S, 34°36'E) and Kusa (01°19'S, 34°51'E) (Figure 1) located in western Kenya were surveyed. All three swamps are listed as Important Bird Areas (Bennun & Njoroge 1999). The swamps are quite diverse in aquatic plants whose abundance and distribution differ considerably (Gichuki *et al.* 2001). Koguta and Kusa are probably important refugia for Lake Victoria's *haplochromine* fish species. Dunga lies 10 km south of Kisumu town, extending southeast along the lakeshore for about 5 km, but varying in width between 50 and 800 m (Bennun & Njoroge 1999). It has considerable ecotourism potential, especially for bird-watching. Nevertheless, its proximity to Kisumu exposes it to high levels of pollution in the form of sewage and solid wastes. Koguta, 30 km southwest of Kisumu is flooded during the rainy season and heavily grazed during the dry season. Kusa occurs at the eastern-most end of Winam Gulf of Lake Victoria, and is close to a major fish landing beach and human settlements.

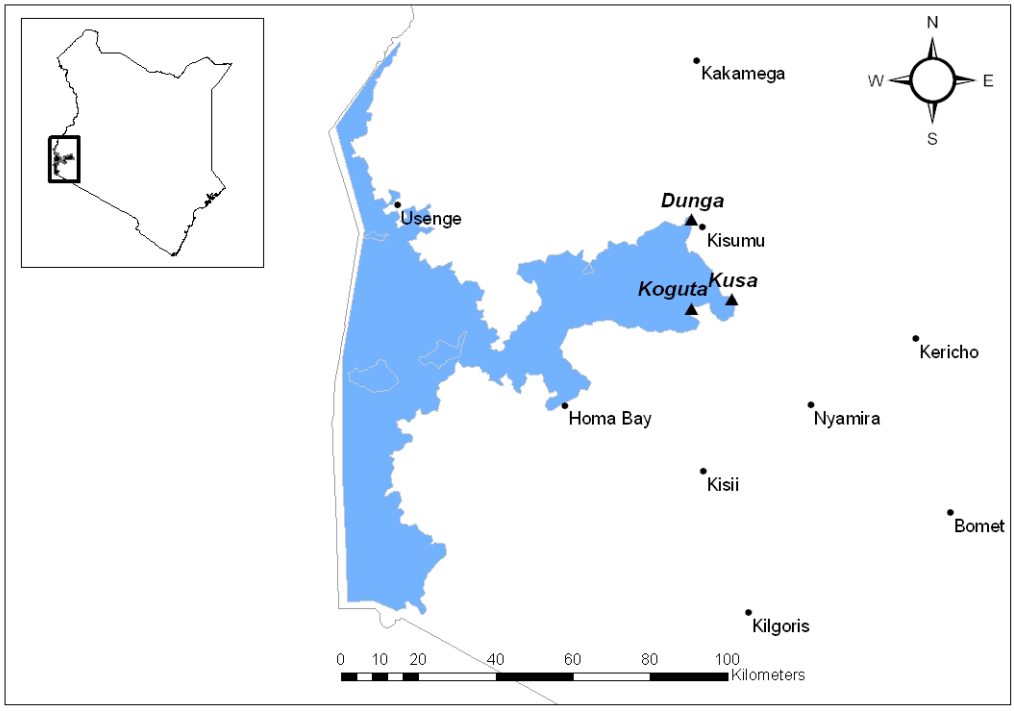

Figure 1. Location of study sites in the Kenyan sector of Lake Victoria.

The study was conducted between June and August 2007. Papyrus endemic birds together with other papyrus-associated species were surveyed at the three sites using fixed-radius point counts and playback calls (Bibby *et al*. 2000). Using sketch maps developed from the most recent aerial photographs, sample stations were selected on lakeward and landward sections of the three sites; landward stations were accessed on foot and lakeward by boat. Twenty randomly selected points (10 each on the lakeward and landward sections), spaced at least 250 m apart and at least 20 m from the edge, were sampled in each of the three study sites. These sampling stations were visited during morning hours (between 06:00 and 11:00); a settling-down period of two-three minutes was allowed before sampling begun. A fixed radius of 40 m was used as standard radius; birds detected beyond this distance or that were flying over the point were not included in these analyses. An initial 10-minute interval was used to detect and count individual birds. This was followed by playback calls for individual papyrus endemic species lasting for an average 15-20 seconds at intervals of 10 seconds to elicit response of more secretive individuals; no counting was done during the playback sessions which were chiefly meant to check for presence of the papyrus endemic birds.

The assessment of habitat conditions for each site involved evaluation of physical characteristics of papyrus and levels of human disturbance. These parameters were visually estimated at all bird survey stations. Assessment of habitat structure was based on papyrus heights and densities. Other plant species at the sampling points were noted. The assessment of papyrus degradation focused on five disturbance agents of: burning, papyrus cutting, livestock grazing, footpaths/trampling, and farming/drainage. These five factors are thought to directly affect papyrus habitat conditions at the three sites (Bennun & Njoroge 1999). Five quadrats measuring approximately 10 x 10 m around each station were assessed for all the habitat variables considered. Papyrus heights were estimated to the nearest 1 m from 0–3 m and percentage cover estimated to the nearest 5%. Counts of individual papyrus endemic birds were used as a response variable in a simple regression with the variables related to papyrus physical structure (papyrus height, density, and disturbance parameters) as the explanatory variables.

Results and Discussion

Playbacks and observations confirmed the presence of five papyrus specialist birds at the three sites, but the numbers were generally low. Overall, White-winged Warbler (n = 98) and Papyrus Gonolek (n = 96) were the most common across the sites, while Papyrus Yellow Warbler was the least common (Table 1). Notably, the Papyrus Canary was not recorded at any of these sites. This was surprising, and could suggest that this species is more sensitive to papyrus disturbance compared to other endemic birds, but this requires more detailed investigation. Generally, the population sizes of the papyrus endemic birds were higher in relatively undisturbed habitats compared to the degraded

habitats. Nevertheless, the five endemics recorded across sites appeared tolerant of low-intensity disturbance, occurring frequently in sections of the swamps that were subject to low-intensity clearance and harvesting. Further, small isolated fragments (< 1 ha) had no papyrus endemic birds, which were present in small fragments that were close to larger ones. This was possibly due to inter-patch movements, especially for Carruthers' Cisticola and Papyrus Gonolek.

Table 1. Numbers of individual endemic birds counted at Dunga, Koguta and Kusa swamps in the Kenyan sector of Lake Victoria.

Species	Dunga	Koguta	Kusa	Total
White-winged Warbler	49	27	22	98
Papyrus Gonolek	59	27	10	96
Greater Swamp Warbler	44	20	10	74
Carruthers's Cisticola	27	19	24	70
Papyrus Yellow Warbler	2	6	3	11

The relationship between numbers of papyrus endemics and papyrus habitat structure indicated that papyrus height was the most important factor in predicting the abundance of birds recorded at each sites. There were highly significant relationships between mean papyrus height and numbers of both the Papyrus Gonolek (R^2 = 0.96, P = 0.001) and White-winged Warbler (R^2 = 0.91, P = 0.02) (Figure 2a & b, respectively). The other three papyrus endemics exhibited weaker, non-significant relationships with mean papyrus heights.

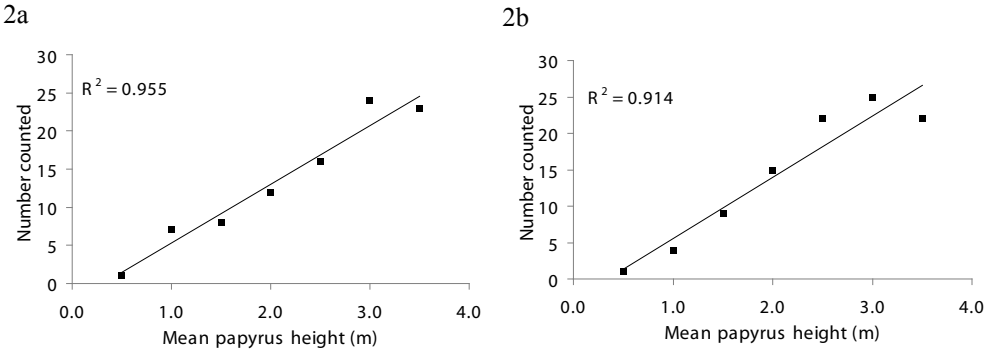

Figure 2. Regression analyses of numbers of Papyrus Gonolek (2a) and White-winged Warbler (2b) against mean papyrus height (m) at Dunga, Kusa and Koguta combined in the Kenyan sector of Lake Victoria.

Playback and intensive searches revealed that smaller fragments situated near the main stands still retain some papyrus endemics. Birds probably moved between these smaller fragments from the main stands, indicating that fragmentation and increasing isolation could deter dispersal in these papyrus endemic species. Thus, as the fragmentation continues with widening gaps

between the fragments, there is likelihood that such movements will be curtailed resulting in isolated populations.

Ecological studies of papyrus have quantified the incredible powers of this plant to grow or recover from destruction (Boar *et al.* 1999). Indeed, observations from previous studies have demonstrated that a clear-cut patch of papyrus could be sufficiently restored in 10 weeks (Thompson *et al*. 1979). However, frequent and repeated harvesting of papyrus is known to reduce its productivity and resilience (Muthuri *et al*. 1989). This can have adverse impacts on papyrus endemic species. Destruction of papyrus swamps for development is a growing environmental problem in the Kenyan sector of Lake Victoria, such that papyrus-dependent biodiversity appears to be in real danger of extirpation. Moreover, the local people continuously harvest papyrus for various socio-economic reasons. Given the high human population growth rates in the region, future demands for papyrus products are set to increase, which is bound to have negative impacts on papyrus endemic bird species as well as other papyrus-associated biodiversity (Owino & Ryan 2007).

In summary, it is important that appropriate conservation measures are undertaken to ensure that sustainable use options are adopted in these three sites. Environmentally-friendly activities such as eco-tourism and bird-watching should be encouraged in the region as a way of boosting the income levels of the local people. This will enable the local people to look at papyrus swamps as important resources that should be conserved in their natural form, and not necessarily resources through exploitation. In addition, our findings suggest that the four key papyrus swamps in the Kenyan sector of Lake Victoria that are presently only listed as Important Bird Areas possibly warrant upgrading to protected areas based on the biota they support as well as current threats. Lastly, it is vital to study and monitor the effects of various papyrus harvesting regimes on particular papyrus endemic species. This would be important in developing appropriate papyrus harvesting guidelines without compromising the conservation of these species.

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References

Bennun, L. & Njoroge, P. 1996. Birds to watch in East Africa: A preliminary Red Data list. *Research Reports of the Centre for Biodiversity, National Museums of Kenya: Ornithology* 23.

Bennun, L.A. & Njoroge, P. 1999. *Important bird areas in Kenya*. Nairobi, Kenya: East Africa Natural History Society.

Bibby, C.J., Burgess, N.D. & Hill, D.A. 2000. *Bird census techniques*. London, UK: Academic Press.

BirdLife International 2004. *Threatened birds of the world.* Cambridge, UK: BirdLife International.

Boar, R.R., Harper, D.M. & Adams, C.S. 1999. Biomass allocation in *Cyperus papyrus* in a tropical wetland, Lake Naivasha, Kenya. *Biotropica* 31: 411-421.

Byaruhanga, A., Kasoma, P. & Pomeroy, D. 2001. *Important bird areas in Uganda*. Kampala, Uganda: East Africa Natural History Society.

Fanshawe, J.F. & Bennun, L.A. 1991. Bird conservation in Kenya: creating a national strategy. *Bird Conservation International* 1: 293-315.

Gichuki, J., Guebas, F.D., Mugo, J., Rabuor, C.O., Triest, L. & Dehairs, F. 2001. Species inventory and the local uses of the plants and fishes of the Lower Sondu Miriu wetland of Lake Victoria, Kenya. *Hydrobiologia* 458: 99-106.

Kairu, J.K. 2001. Wetland use and impact on Lake Victoria, Kenya region. *Lakes Resources and Management* 6: 117-125.

Leisler, B. & Winkler, H. 2001. Morphological convergence in papyrus dwelling passerines. *Ostrich* 15: 24-29.

Maclean, I.M.D., Hassall, M., Boar, R. & Nasirwa, O. 2003. Effects of habitat degradation on avian guilds in East African papyrus *Cyperus papyrus* swamps. *Bird Conservation International* 13: 283-297.

Muthuri, F.M., Jones, M.B. & Mimbamba, S.K. 1989. Primary productivity of papyrus cyperus papyus in a tropical swamp, Lake Naivasha, Kenya. *Biomass* 18: 1-14.

Owino, A.O. & Ryan, P.G. 2007. Recent papyrus habitat loss and conservation implications in western Kenya. *Wetlands Ecology and Management* 15: 1-12.

Thompson, K., Shewry, P.R. & Woolhouse, H.W. 1979. Papyrus development in the Upemba Basin, Zaire: population structure in *Cyperus papyrus* stands. *Botanical Journal of the Linnaean Society* 78: 299-316.

Alfred O. Owino
Biodiversity Research & Monitoring Division, Kenya Wildlife Service, P.O. Box 40241-00100, Nairobi, Kenya. E-mail for correspondence: Alfred@kws.go.ke
Joseph O. Oyugi
Biology Department, Wright College 4300 N. Narragansett, Chicago, Il 60634, USA. E-mail: joyugi@ccc.edu

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