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Recovery of bird communities after selective logging and clear-cutting in Kibale National Park, Uganda

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In the face of the continuing destruction of tropical rainforests, a major challenge is to understand the consequences of these habitat changes for biodiversity and the time scale at which biodiversity can recover after such disturbances. In this study, we assessed the patterns in communities of birds among forests of varying age consisting of clear-cuts of former coniferous plantations, selectively logged compartments and primary forests in Kibale National Park, Uganda. Birds were surveyed by 10-minute point counts at 174 randomly located points in nine forest areas during September–October 2011. A total of 2 688 birds representing 115 species were recorded. The species density, diversity and dominance of all birds, and dominance of forest specialists showed no differences between forest areas, whereas the species density and diversity of forest specialists differed significantly between forest areas. The composition of communities of all birds and of forest specialists varied significantly among the forest areas. Our results show that even after 19 and 43 years, respectively, communities of birds in clear-cuts of former coniferous plantations and selectively logged forests have not fully recovered from the disturbances of logging, highlighting the need to preserve primary forests for conservation of birds.

Keywords: biodiversity, human-induced disturbances, Kibale National Park, recovery, Uganda

Introduction

Tropical rainforests are facing rapid clearance, posing a threat to their biodiversity (Dirzo and Raven 2003). For example, during the past century, rainforest cover in Uganda decreased from 35% to 16% of its land area (Kayanja and Byarugaba 2001), and the annual rate of tropical forest loss is estimated at 7% (Pomeroy and Tushabe 2004). In addition to clearance for agriculture, tropical rain forests are being harvested for silvicultural purposes. In recent decades, interest to restore degraded landscapes has increased in the tropics (Lamb 1998). However, whether or not rainforests can fully recover naturally after logging, or if rainforest recovery can be accelerated with human-assisted planting of indigenous trees remains controversial. Research at the community level using appropriate indicator taxa can help to gain this understanding (van der Putten et al. 2004).

Birds are a visible, taxonomically well-known group and their communities are highly sensitive to human-induced habitat modifications (Raman and Sukumar 2002), which make them good indicators of habitat change (Zakaria et al. 2005). In Uganda, Dranzoa (1998), Sekercioglu (2002) and Massimino et al. (2008) all found that the species richness, diversity and relative frequencies of birds in Kibale National Park have not recovered fully from logging in 1968–1969. Overall, however, studies concerning changes in bird communities in tropical forests after logging have failed to find general patterns in species richness or abundance measures (Ghazoul and Hellier 2000). Instead of only using these univarite measures, such as species richness and diversity, this study also assessed how bird community composition recovers after logging in forest areas of varying age, consisting of regenerating clear-cuts of former coniferous plantations, selectively logged compartments and primary forests. Specific questions addressed were: (1) are there differences in species density, diversity, dominance or community composition of all birds, or of forest-specialist birds, among forest areas of varying age, and (2) which species characterise different age groups of forests?

Materials and methods

Study area

We studied the recovery of bird communities in a moist tropical rainforest of Kibale National Park (KNP) in Uganda (0°13′–0°41′ N, 30°19′–30°32′ E), covering an area of 795 km² (Chapman et al. 2005). In, KNP, altitude ranges from 1 110 to 1 590 m above sea level, mean annual rainfall is 1 749 mm (peaks occurring in March–May and in September–November), and mean daily minimum and mean daily maximum temperatures are 14.9 and 20.2 °C, respectively (Chapman et al. 2005). Kibale comprises mature primary forests, naturally regenerating logged forests, grassland and swamps (Struhsaker 1997). Kibale has been divided into study forest areas for scientific purposes, and nine of those areas were studied in our research. Out of the nine studied forest areas, seven have been logged in different times and intensities, and left to regenerate naturally without human assistance. The studied forest areas represent three age groups: (1) former pine plantations clear-cut during the period 1987–2004,

(2) selectively logged forest compartments logged in 1968–1969, and (3) primary forests that have remained in their natural state without notable human disturbances (Figure 1, Table 1).

Bird surveys

Bird surveys were conducted in September–October 2011 using point counts. Counts were conducted at 174 randomly located points (Figure 1, Table 1), a minimum of 150 m apart, during periods of peak bird activity from 07:00 to 11:30, and only under good weather conditions. The same trained counter (PL) performed all counts. All individuals seen or heard were recorded within a 10-minute interval at each point, commenced 2 min after arriving at the location. Overflying birds were excluded from the analysis. For poorly seen or heard groups, the average observed species group size was used.

Data analysis

Sample-based species accumulation curves, replotted against the *x*-axis of individual abundances (Gotelli and Colwell 2011), with 95% confidence intervals (CIs), were generated in EstimateS 9.1.0 (Colwell 2013) for the nine forest areas, allowing us to compare the rarefied total species richness.

The bird species were assigned to three habitat categories (Bennun et al. 1996): forest specialists (FF), forest generalists (F) and forest visitors (f). We calculated the species density (number of species/point), Shannon diversity index and Berger–Parker dominance index of all birds and of forest specialist species, for each point with PRIMER-E software (Berger and Parker 1970; Magurran 2004; Clarke and Gorley 2006). Differences among the forest areas in species density, diversity and dominance indices of all birds and of forest specialists were tested with one-way analysis of variance (ANOVA) or Kruskal–Wallis tests followed by appropriate *post-hoc* tests with SPSS 19 (IBM Corporation, Armonk, NY, USA).

Permutational multivariate analysis, PERMANOVA in PRIMER-E, with unrestricted 999 permutations of the raw data, was used to test for differences in the community composition of all birds, and of forest specialists, among the forest areas (Anderson et al. 2008). Non-metric multidimensional scaling (NMDS) was used to visualise differences and similarities in communities of all birds and of forest specialists among the forest areas (Clarke and Gorley

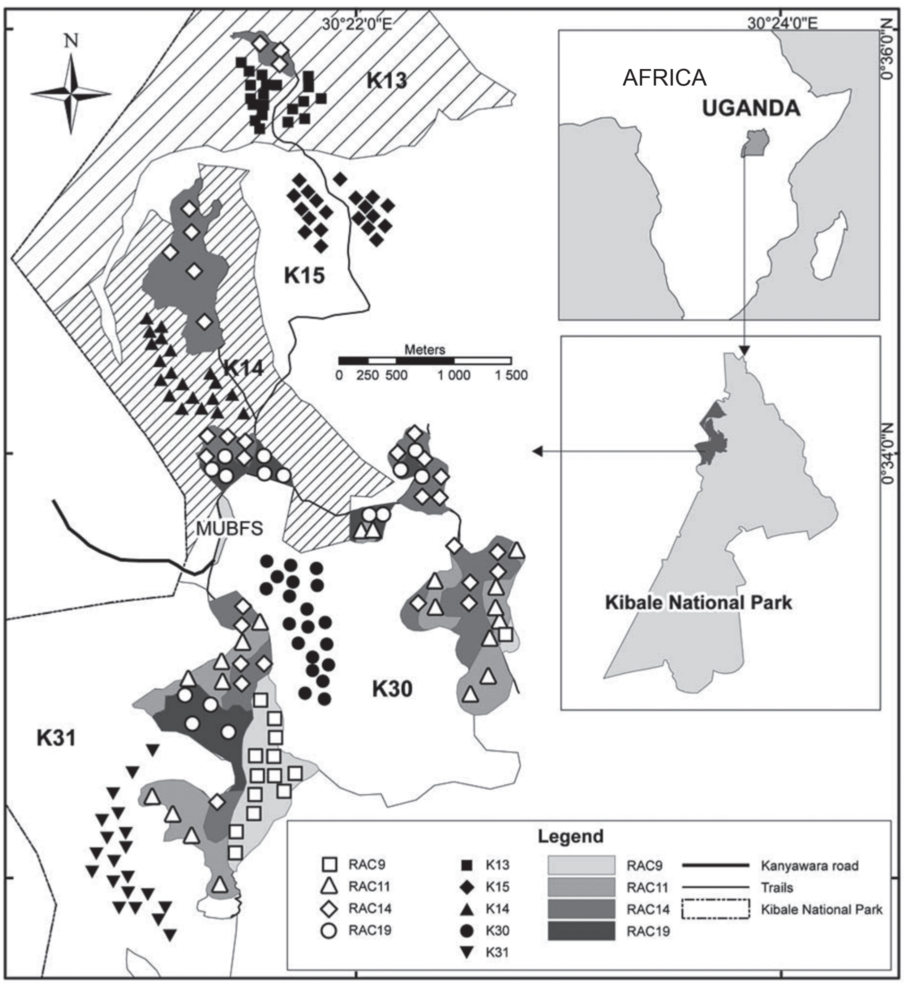

Figure 1: Map of the study area in Kibale National Park, Uganda

2006). For clarity, distances among centroids of forest areas are shown. All multivariate analyses were based on the Bray–Curtis similarity matrix between samples representing the square-root-transformed abundance data of each point.

Indicator species analysis (Dufrene and Legendre 1997), using the labdsv package (Roberts 2012) in R (R Development Core Team 2010), was used to examine the species characterising the three age groups: 9- to 19-year-old clear-cuts; 43-year-old selectively logged compartments; and primary forests. Species with an index value (IndVal) > 0.25 were considered as indicator species (Dufrene and Legendre 1997). To illustrate the change in bird communities, we plotted the proportional abundances of each indicator species against the age since disturbance (for each indicator species, the average number of individuals/point was calculated to each age since disturbance, these values were summed, and the proportion of the sum was then calculated for each age since disturbance).

We evaluated the possible spatial autocorrelation in bird community similarity, species density (per point) and abundance (per point), which could influence the interpretation of the results. Mantel tests were run to test for correlations between similarity in bird community composition (Bray–Curtis similarity), species density or abundance (Euclidean distance) and physical distance, using the ade4 package (Chessel and Dufour 2011) in R (R Development Core Team 2010).

Results

A total of 2 688 birds representing 115 species were recorded during point counts (Appendix 1). Species accumulation curves (Figure 2a) nearly reached asymptotes for all forest areas. Based on the rarefied species richness values for 198 individuals (the highest shared number of individuals across forest areas), and their 95% CIs, we

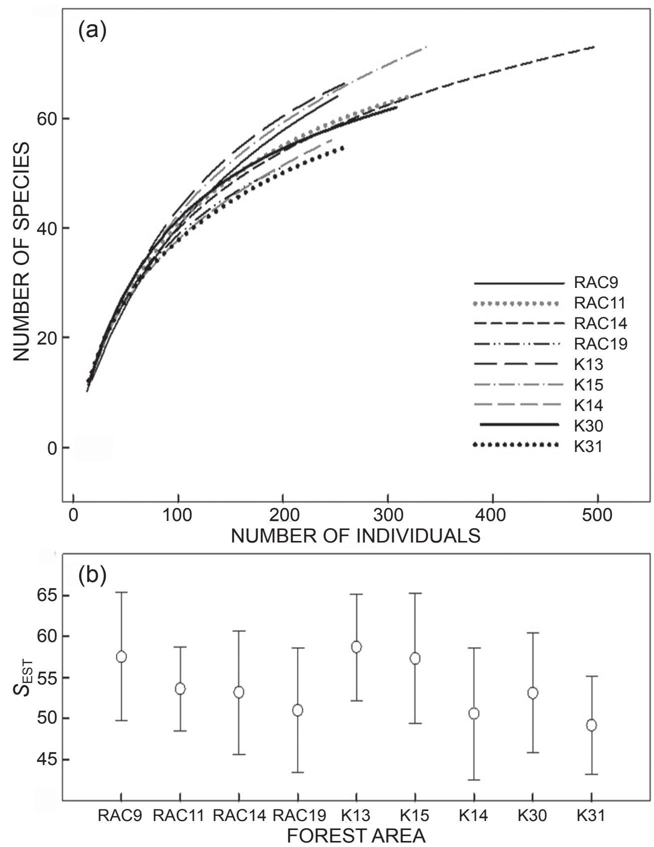

Figure 2: (a) Sample-based species accumulation curves, *x*-axis scaled to represent numbers of individuals, for the nine forest areas in KNP, Uganda. RAC9–19 = 9- to 19-year-old clear-cut areas, K13–15 = 43-year-old selectively logged compartments, K30–31 = primary forests. (b) Rarefied total species richness (S_{est}) with 95% confidence intervals (calculated for the largest number of shared individuals, 198) for the nine forest areas in KNP, Uganda

Table 1: Description of forest areas studied in Kibale National Park, Uganda. Age data were obtained from Nyafwono et al. (2014)

Forest area	Management history	Area sampled (ha)	Median age of regeneration (y)	No. of points per forest area
Clear-cut areas				
RAC9	Conifer plantation clear-cut between 2002–2004 and left under natural regeneration	60	9	14
RAC11	Conifer plantation clear-cut between 2000–2001 and left under natural regeneration	104	11	19
RAC14	Conifer plantation clear-cut between 1995–1999 and left under natural regeneration	172	14	31
RAC19	Conifer plantation clear-cut between 1987–1994 and left under natural regeneration	61	19	14
Selectively logged compartments				
K13	Heavily logged in 1968 (50% basal area reduction), treated with arboricides; Finopal (2:1 mixture of 2,4-D and 2,4,5-T) and left under natural regeneration	41	43	20
K15	Heavily logged between 1968–1969 (47% basal area reduction) and left under natural regeneration	55	43	20
K14	Lightly logged in 1969 (25% basal area reduction) and left under natural regeneration	51	42	18
Primary forests				
K30	Primary forest. Two to three trees per km^2 felled by pit sawyers prior to 1970 with minimal impact on forest structure	61	–	20
K31	Primary forest. Unlogged part of K31	72	–	18

found no differences in the total species richness among the forest areas (Figure 2b).

There were no significant differences in species density, diversity and dominance of all birds among the nine forest areas (species density ANOVA: $F_{8,165}$ = 1.29, p = 0.253; Shannon diversity index ANOVA: $F_{8,165}$ = 1.27, p = 0.260; Berger–Parker index Kruskal–Wallis: χ^2 = 11.00, df = 8, p = 0.202; Figure 3a–d). However, the species density and diversity of forest specialists differed significantly among the nine forest areas (species density ANOVA: $F_{8,165}$ = 3.16, p = 0.002; Shannon diversity index Kruskal–Wallis: χ^2 = 20.42, df = 8, p = 0.009), but not the Berger–Parker dominance index (Kruskal–Wallis: χ^2 = 10.10, df = 8, p = 0.258; Figure 3e–h). Species density of forest specialists was significantly lower in the clear-cut areas RAC9, RAC11 and RAC14 than in primary forest K30 (Figure 3e). Although the Kruskal–Wallis test indicated there were differences in the Shannon diversity index of forest specialists between forest areas, pairwise comparisons did not reveal any differences (Figure 3g).

The community composition of all birds differed significantly among the nine forest areas (PERMANOVA, pseudo-$F_{8,165}$ = 4.02, p = 0.001; illustrated by the NMDS ordination, Figure 4a) and forest area explained 42% of the

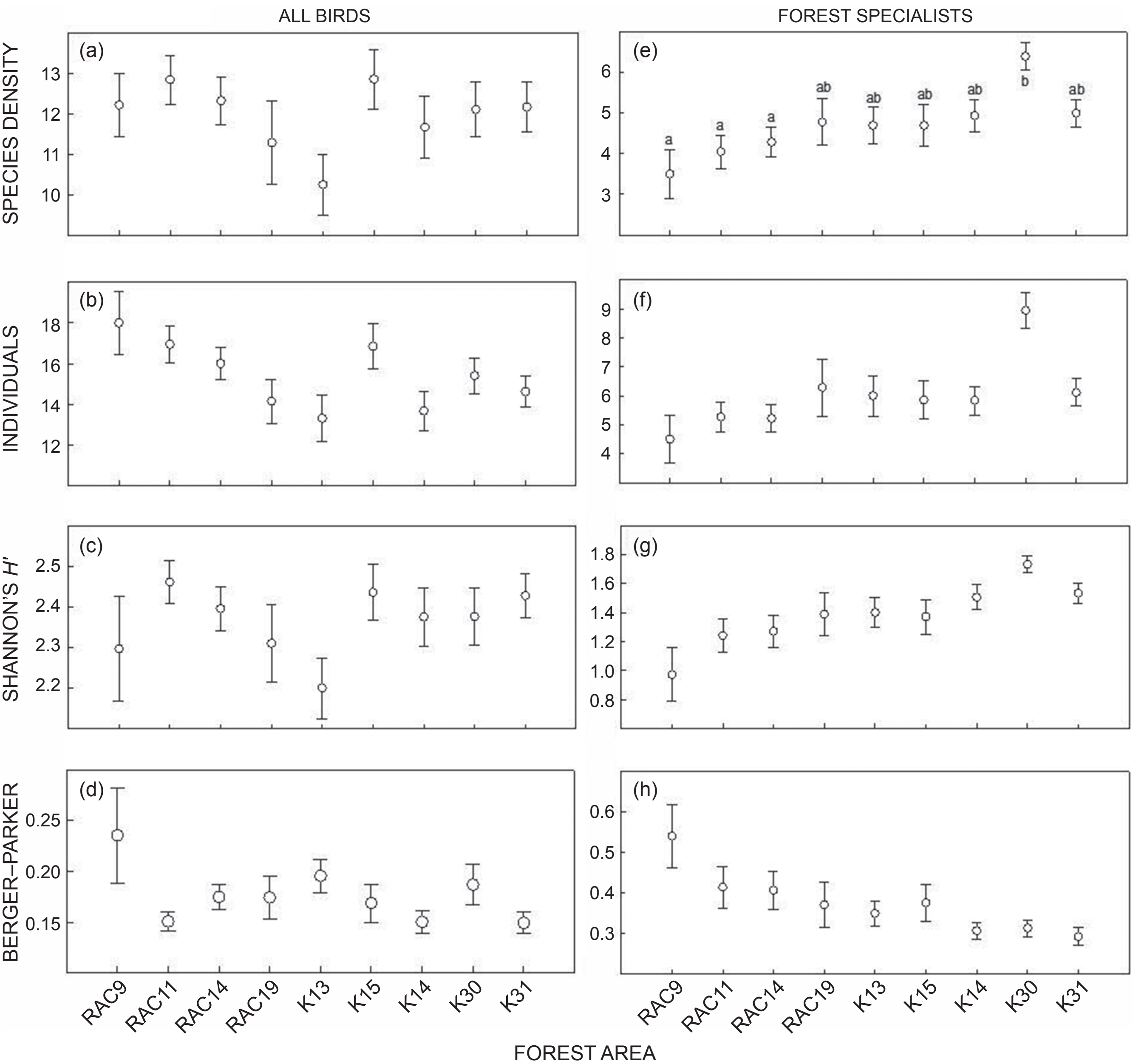

Figure 3: (a) Bird species density, (b) bird abundance (individuals/point), (c) bird diversity (Shannon), (d) bird dominance (Berger–Parker), (e) forest specialist species density, (f) forest specialist abundance (individuals/point), (g) forest specialist diversity (Shannon), and (h) forest specialist dominance (Berger–Parker) in the nine forest areas in Kibale National Park, Uganda. Hollow circles represent averages (error bars indicate the SE). Forest areas differing from each other in pairwise comparisons (Tukey, $p < 0.05$) are indicated by different letters

variation in communities of birds. According to the pairwise tests, communities of all selectively logged compartments differed from each other and from all primary forests ($p < 0.05$). Interestingly, the two primary forests differed from each other ($p < 0.05$). All selectively logged compartments and all primary forests differed from all clear-cuts ($p < 0.05$). In addition, community composition of forest specialists differed significantly among the forest areas (pseudo-$F_{8,165} = 2.75$, $p = 0.001$; Figure 4b). Communities of all selectively logged compartments differed from all primary forests, and, again, the two primary forests differed from each other ($p < 0.05$). In addition, some clear-cuts differed from some selectively logged compartments (RAC9, RAC11 and RAC19 from K15; and RAC9 from K13; $p < 0.05$) and all clear-cuts differed from both primary forests ($p < 0.05$).

A total of seven indicator species were identified for the three age groups of forests (Figure 5). Grey-backed Camaroptera *Camaroptera brachyura* (IndVal = 0.70), Little Greenbul *Andropadus virens* (0.42) and Yellow-rumped Tinkerbird *Pogoniulus bilienatus* (0.35) characterised the 9- to 19-year-old clear-cut areas; Yellow-whiskered Greenbul *Andropadus latirostris* (0.38) and Black-faced Rufous Warbler *Bathmocercus rufus* (0.36) characterised the 43-year-old selectively logged compartments; and Buff-throated Apalis *Apalis rufogularis* (0.36), Yellow-throated Tinkerbird *Pogoniulus subsulphureus* (0.32) and Yellow-whiskered Greenbul (0.28) characterised primary forests.

Based on the Mantel tests, we found no evidence of spatial autocorrelation in community similarity ($p = 1.00$), species density ($p = 0.601$) or abundance ($p = 0.106$).

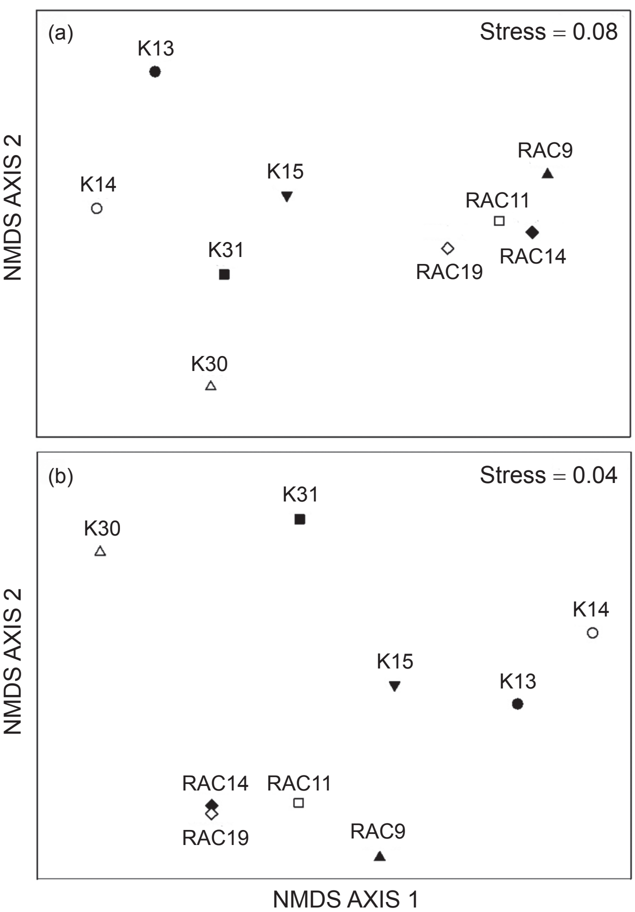

Figure 4: Non-metric multidimensional scaling (NMDS) ordination showing the similarities in communities (a) of all birds, and (b) of forest specialists, among 9- to 19-year-old clear-cut areas, 43-year-old selectively logged compartments and primary forests of Kibale National Park, Uganda. Symbols represent centroids of forest areas

Discussion

Our results show that the composition of bird communities of clear-cuts of former coniferous forests and selectively logged compartments were still significantly different from those of primary forests after 19 and 43 years, respectively, of natural regeneration. The clear-cut areas were characterised by forest visitor and generalist species (Grey-backed Camaroptera, Little Greenbul and Yellow-rumped Tinkerbird), whereas selectively logged compartments were already characterised by forest specialist (Black-faced Rufous Warbler) as well as forest generalist (Yellow-whiskered Greenbul) species, suggesting that these compartments might have regained some qualities

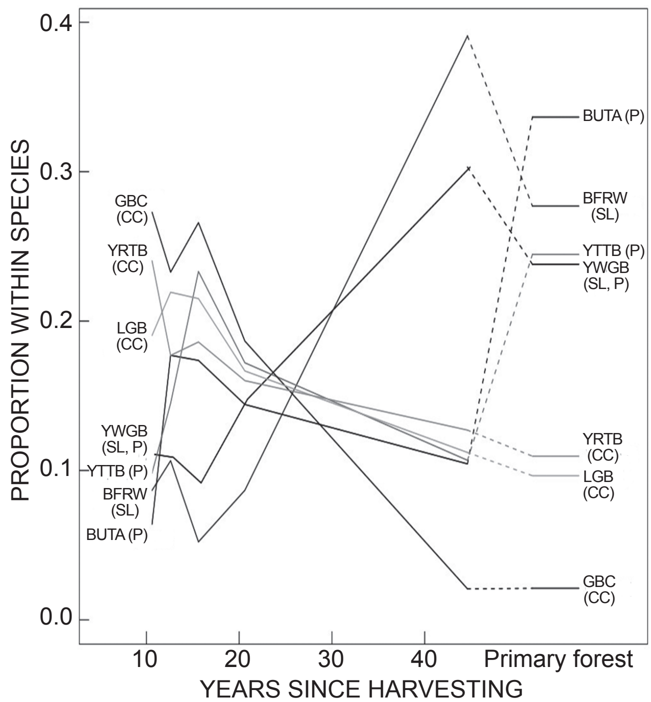

Figure 5: Proportional abundances of each indicator species (Dufrene–Legendre indicator species analysis) in the three age groups, plotted against the years since disturbance. Proportions in primary forests are given on the right. The age group that each species indicates is given in the parentheses after species name (clear-cut areas: CC = RAC9–19; selectively logged compartments: SL = K13–15; primary forests: P = K30–31). Species abbreviations: GBC = Grey-backed Camaroptera, LGB = Little Greenbul, YRTB = Yellow-rumped Tinkerbird, YWGB = Yellow-whiskered Greenbul, BFRW = Black-faced Rufous Warbler, BUTA = Buff-throated Apalis, YTTB = Yellow-throated Tinkerbird

of primary forests. Primary forests were characterised by forest specialist (Buff-throated Apalis and Yellow-throated Tinkerbird) and forest generalist (Yellow-whiskered Greenbul) species. In addition, forest specialist species density was highest in one of the primary forests (Figure 5).

Interestingly, the two primary forests had very different bird community compositions. Owiny et al. (unpublished data) also found different tree species compositions in these primary forests. Therefore, the significant differences within and among communities of selectively logged and primary forests might be explained by the differences in their tree community compositions (Raman et al. 1998) and canopy closure (Sekercioglu 2002). However, the recovery of vegetation might not be the only factor affecting the recovery of birds after disturbance. The lack of patterns in species richness, diversity and dominance of all birds among the forest areas (see also Ghazoul and Hellier 2000) could be due to the fact that birds can easily move between different habitat types while feeding or breeding (Neuschulz et al. 2013). If the recolonisation sources are close (as in our study), primary forest species can also be present (albeit with smaller abundances, as suggested by significant differences in community compositions in our study) in younger forest areas. Dranzoa (2000) found that breeding of some forest specialist species took place in both logged and primary forests of KNP, although the breeding populations remained depressed in logged forests. In more fragmented areas, the limited dispersal abilities of forest specialists, especially understory insectivores, seem to be essential in explaining the recovery of communities of birds (Sekercioglu et al. 2002). Clearly, the movement of birds between habitats is an important determinant of bird communities among differently managed forest areas, and future studies should explore the source–sink dynamics of bird populations among differently aged habitats.

Our results indicate that a lengthy time may be needed for the recovery of bird communities to their natural state after disturbance. Even after 43 years of natural regeneration, the community composition of forest specialists still differs from primary forests. Although Dunn (2004) concluded that the species richness of animal taxa can be predicted to resemble those of mature tropical forests roughly 20–40 years after habitat disturbance, some mature forest species may be still missing from secondary tropical forests 100 years after disturbance (Raman et al. 1998). These findings, as well as our study, demonstrate that the time-scale of rainforest birds' recovery after disturbances is not yet properly understood. In addition, natural succession can lead to polyclimaxes (references in Begon et al. 2006) or stay arrested for long time periods (Chapman and Chapman 1997). Here, the bird communities of the two primary forests differed from each other, and similar differences were also found in their communities of butterflies and trees (Nyafwono et al. 2014; A Owiny unpublished data). The large variation among communities of primary forests makes it difficult to estimate when the communities of disturbed areas have recovered fully. As yet, it is unknown if recovery by natural regeneration of communities of birds after disturbance is fully possible.

Conclusion

Our study demonstrates that clear-cut and selectively logged compartments of Kibale National Park do not yet support communities of birds like those in primary forests, even after 19 and 43 years, respectively, of natural regeneration, despite the closeness of the recolonisation source populations in primary forests. These results indicate that clear-cut and selective logging in the tropics can have remarkable long-term impacts on communities of birds, highlighting the need to preserve primary forests as a long-term conservation strategy for birds.

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Appendix 1: List of bird species detected during point counts in September and October 2011 in Kibale National Park, Uganda. Habitat categories (Bennun et al. 1996): FF = forest specialist, F = forest generalist, f = forest visitor

Species	Scientific name	Habitat category	Detected individuals
Crested Guineafowl	*Guttera pucherani*	F	6
White-spotted Flufftail	*Sarothrura pulchra*	F	9
African Green Pigeon	*Treron calvus*	F	1
Tambourine Dove	*Turtur tympanistria*	F	86
Western Bronze-naped Dove	*Columba iriditorques*	FF	1
African Olive Pigeon	*Columba arquatrix*	FF	1
Afep Pigeon	*Columba unicincta*	FF	4
Red-eyed Dove	*Streptopelia semitorquata*	f	12
Great Blue Turaco	*Corythaeola cristata*	F	18
Black-billed Turaco	*Tauraco schuetti*	FF	17
Levaillant's Cuckoo	*Clamator levaillantii*	f	1
Red-chested Cuckoo	*Cuculus solitarius*	F	17
Black Cuckoo	*Cuculus clamosus*	FF	1
Dusky Long-tailed Cuckoo	*Cercococcyx mechowi*	FF	19
Olive Long-tailed Cuckoo	*Cercococcyx olivinus*	FF	1
African Emerald Cuckoo	*Chrysococcyx cupreus*	F	9
Klaas Cuckoo	*Chrysococcyx klaas*	f	1
Yellowbill	*Ceuthmochares aereus*	F	15
White-browed Coucal	Centropus superciliosus		1
Speckled Mousebird	*Colius striatus*	F	3
Narina Trogon	*Apaloderma narina*	F	22
Blue-breasted Kingfisher	*Halcyon malimbica*	F	6
Black Bee-eater	*Merops gularis*	FF	5
White-throated Bee-eater	*Merops albicollis*	f	10
White-headed Wood-hoopoe	*Phoeniculus bollei*	FF	33
Crowned Hornbill	*Tockus alboterminatus*	f	3
Black-and-white-casqued Hornbill	*Bycanistes subcylindrica*	F	27
Grey-throated Barbet	*Gymnobucco bonapartei*	F	13
Speckled Tinkerbird	*Pogoniulus scolopaceus*	F	67
Yellow-throated Tinkerbird	*Pogoniulus subsulphureus*	FF	85
Yellow-rumped Tinkerbird	*Pogoniulus bilineatus*	F	164
Yellow-spotted Barbet	*Buccanodon duchaillui*	FF	20
Hairy-breasted Barbet	*Tricholaema hirsuta*	F	28
Double-toothed Barbet	*Lybius bidentatus*	f	2
Yellow-billed Barbet	*Trachyphonus purpuratus*	F	12
Brown-eared Woodpecker	*Campethera caroli*	F	6
Bearded Woodpecker	*Dendropicos namaquus*	f	1
Yellow-crested Woodpecker	*Dendropicos xantholophus*	F	5
African Broadbill	*Smithornis capensis*	FF	2
Mosque Swallow	*Hirundo senegalensis*		1
Lesser Striped Swallow	*Hirundo abyssinica*		28
Angola Swallow	*Hirundo angolensis*		2
Petit's Cuckoo Shrike	*Campephaga petiti*	FF	7
Little Greenbul	*Andropadus virens*	F	156
Cameroon Sombre Greenbul	*Andropadus curvirostris*	FF	18
Slender-billed Greenbul	*Andropadus gracilirostris*	FF	38
Yellow-whiskered Greenbul	*Andropadus latirostris*	F	136
Honeyguide Greenbul	*Baeopogon indicator*	FF	27
Joyful Greenbul	*Chlorocichla laetissima*	F	14
Toro Olive Greenbul	*Phyllastrephus hypochloris*	FF	26
Cabani's Greenbul	*Phyllastrephus cabanisi*	FF	30
White-throated Greenbul	*Phyllastrephus albigularis*	FF	2
Red-tailed Bristlebill	*Bleda syndactylus*	FF	17
Common Bulbul	*Pycnonotus barbatus*	f	21
Western Nicator	*Nicator chloris*	F	45
Equatorial Akalat	*Sheppardia aequatorialis*	FF	2
Blue-shouldered Robin-chat	*Cossypha cyanocampter*	F	26
Red-capped Robin-chat	*Cossypha natalensis*	F	4
Fire-crested Alethe	*Alethe diademata*	FF	3
Brown-chested Alethe	*Alethe poliocephala*	FF	11
Red-tailed Ant-thrush	*Neocossyphus rufus*	FF	1
White-tailed Ant-thrush	*Neocossyphus poensis*	FF	14

Appendix 1: (cont.)

English name	Scientific name	Habitat category	Detected individuals
Rufous Flycatcher-thrush	*Stizorhina fraseri*	FF	21
Black-faced Rufous Warbler	*Bathmocercus rufus*	FF	97
Chubb's Cisticola	*Cisticola chubbi*	F	4
Banded Prinia	*Prinia bairdii*	F	18
White-chinned Prinia	*Prinia leucopogon*	F	45
Masked Apalis	*Apalis binotata*	FF	27
Black-throated Apalis	*Apalis jacksoni*	FF	13
Buff-throated Apalis	*Apalis rufogularis*	FF	136
Grey-backed Camaroptera	*Camaroptera brachyura*	f	105
Olive-green Camaroptera	*Camaroptera chloronota*	FF	15
Green Crombec	*Sylvietta virens*	F	59
Green Hylia	*Hylia prasina*	F	56
Dusky-blue Flycatcher	*Muscicapa comitata*	F	2
Grey-throated Flycatcher	*Myioparus griseigularis*	FF	16
Black-headed Paradise Flycatcher	*Terpsiphone rufiventer*	FF	9
African Shrike-flycatcher	*Megabyas flammulatus*	FF	10
Black-and-white Shrike-flycatcher	*Bias musicus*	f	2
Chestnut Wattle-eye	*Platysteira castanea*	FF	20
Jameson's Wattle-eye	*Platysteira jamesoni*	FF	13
Brown-throated Wattle-eye	*Platysteira cyanea*	f	6
Brown Illadopsis	*Illadopsis fulvescens*	FF	34
Scaly-breasted Illadopsis	*Illadopsis albipectus*	FF	42
Dusky Tit	*Parus funereus*	FF	20
Green Sunbird	*Anthreptes rectirostris*	FF	25
Green-headed Sunbird	*Nectarinia verticalis*	F	7
Blue-throated Brown Sunbird	*Nectarinia cyanolaema*	FF	52
Olive Sunbird	*Cyanomitra olivacea*	FF	86
Scarlet-chested Sunbird	*Chalcomitra senegalensis*		1
Collared Sunbird	*Hedydipna collaris*	F	40
Olive-bellied Sunbird	*Nectarinia chloropygia*	F	20
Superb Sunbird	*Nectarinia superba*	F	2
Yellow White-eye	*Zosterops senegalensis*	f	20
Many-coloured Bush-shrike	*Malaconotus multicolor*	FF	5
Bocage's Bush-shrike	*Malaconotus bocagei*	F	2
Brown-crowned Tchagra	*Tchagra australis*		4
Pink-footed Puffback	*Dryoscopus angolensis*	FF	5
Northern Puffback	*Dryoscopus gambensis*	F	1
Lühder's Bush-shrike	*Laniarius luehderi*	F	59
Western Black-headed Oriole	*Oriolus brachyrhynchus*	F	20
Montane Oriole	*Oriolus percivali*	FF	2
Velvet-mantled Drongo	*Dicrurus modestus*	F	6
Purple-headed Starling	*Lamprotornis purpureiceps*	F	26
Splendid Starling	*Lamprotornis splendidus*	F	27
Black-necked Weaver	*Ploceus nigricollis*	f	2
Dark-backed Weaver	*Ploceus bicolor*	F	35
Red-headed Malimbe	*Malimbus rubricollis*	FF	5
Grosbeak Weaver	*Amblyospiza albifrons*	f	4
Grey-headed Negrofinch	*Nigrita canicapilla*	F	22
White-breasted Negrofinch	*Nigrita fusconota*	F	56
White-collared Olive-back	*Nesocharis ansorgei*	f	3
Red-headed Bluebill	*Spermophaga ruficapilla*	F	12
Green-backed Twinspot	*Mandingoa nitidula*	FF	4
Thick-billed Seed-eater	*Serinus burtoni*	FF	2