Papers: Localities

Ringing efforts in two South African mistbelt mixed *Podocarpus* forests

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INTRODUCTION

Mistbelt Mixed *Podocarpus* forest is one of eight forest types found in KwaZulu-Natal Province, South Africa (Cooper 1985). Characteristic bird species of these naturally fragmented forest patches include Knysna Lourie *Tauraco corythaix*, Narina Trogon *Apaloderma narina*, Cinnamon Dove *Aplopelia larvata*, Orange Thrush *Zoothera gurneyi*, Crowned Eagle *Stephanoaetus coronatus* and Starred Robin *Pogonocichla stellata* (Cooper 1985). This forest type occurs from an altitude of 900–1700 m a.s.l. from Alice in the Eastern Cape Province, through the midlands of the former Transkei, to Qudeni in the midlands of KwaZulu-Natal (Moll 1972; Cooper 1985; Midgeley *et al.* 1997). Naturally occurring forest patches range in size from a few hectares in valleys to over 1000 hectares at Blinkwater forest near Seven Oaks, KwaZulu-Natal (Cooper 1985). Indications are that in the past they occupied a larger area than today (Fourcade 1889; King 1940; Rycroft 1944; Moll 1972; Wager 1976; Cooper 1985; McCracken 1987). Furthermore, anthropogenic disturbance processes and exploitation threaten forest specific species found in these forests (Cooper 1985; Midgeley *et al.* 1997). The aspect is predominantly south facing and rainfall often exceeds 1000 mm per annum, falling mainly in summer (Moll 1972). Temperatures range from –4°C to 37°C with a mean of 16°C (Moll 1972).

Unique assemblages of birds have evolved in these forest patches and were investigated by the initiation of monthly observations and a long term bird ringing project in and near two forests in the KwaZulu-Natal Midlands. Opportunistic ringing was done in order to record species not seen or heard and to supplement observational data. This project was also initiated to investigate longevity of afromontane forest bird species and preliminary results of these ringing efforts are presented and discussed.

MATERIALS AND METHODS

1. Bird ringing

Bird ringing was carried out periodically from August 1994 to April 1999 at two study sites (Table 1) using 12 m × 2 m × 16 mm mesh nets. Nets supported by 3 m aluminium poles were placed along a transect at each ringing site. Netting at Hlabeni occurred along a 50–70 m transect in the north-east portion of the forest, in adjoining *Protea caffra*-grassland on the north east margin of the forest (29°57'S, 29°45'E), and near a perennial stream on the north-east margin of the forest. All sites were situated <400 m from one another. At Ngele forest netting occurred along a vehicle track through the forest (30°31'S, 29°40'E), at Mackton Lodge garden (an old farmhouse near Ngele forest) (30°32'22"S, 29°40'32"E), and at the SAFCOL Offices (South African Forestry Company Ltd.) (30°36'S, 29°44'E) in a patch of artificially planted *Protea* species. Netting time period and length of net erected were recorded.

Table 1. Summary of study sites.

Forest	Locality	Area (ha)	Altitude
Hlabeni forest	29°58'S, 29°44'E	402	140 m–1680 m
Ngele forest	30°32'S, 29°42'E	752	1250 m–1550 m

Table 2. Bird species ringed at respective forest ringing sites showing individuals ringed and recaptures more than a month later in parentheses ([1] indicates only caught outside forest, [2] indicates only caught inside forest, [3] indicates forest specific species (Oatley 1989), [4] indicates forest utilizing species).

Species		Hlabeni	Ngele	Total
African Goshawk [3, 4]	*Accipiter tachiro*	2	–	2
Rameron Pigeon [1, 4]	*Columba arquatrix*	13	–	13
Cape Turtle Dove [1, 4]	*Streptopelia capicola*	1	–	1
Cinnamon Dove [2, 3, 4]	*Aplopelia larvata*	2	–	2
Knysna Lourie [1, 3, 4]	*Tauraco corythaix*	–	1	1
Wood Owl [2, 3, 4]	*Strix woodfordii*	1	–	1
Fierynecked Nightjar [1]	*Caprimulgus pectoralis*	–	2	2
Speckled Mousebird [4]	*Colius striatus*	–	7	7
Narina Trogon [2, 3, 4]	*Aploderma narina*	–	1	1
Olive Woodpecker [2, 3, 4]	*Mesopicos griseocephalus*	2	–	2
Forktailed Drongo [1, 4]	*Dicrurus adsimilis*	–	1	1
Blackheaded Oriole [1, 4]	*Oriolus larvatus*	1	–	1
Southern Black Tit [1, 4]	*Parus niger*	3	1	4
Bush Blackcap [2, 3, 4]	*Lioptilus nigricapillus*	–	7	7
Blackeyed Bulbul [4]	*Pycnonotus barbartus*	9	6	15
Terrestrial Bulbul [2, 4]	*Phyllastrephus terrestris*	5(1)	7(1)	12(2)
Sombre Bulbul [4]	*Andropadus importunus*	6	6(2)	12(2)
Olive Thrush [4]	*Turdus olivaceus*	11	26	37
Orange Thrush [2, 3, 4]	*Zoothera gurneyi*	4(2)	1	5(2)
Stonechat	*Saxicola torquata*	1	–	1
Chorister Robin [2, 3, 4]	*Cossypha dichroa*	5(2)	2	7(2)
Cape Robin [4]	*Cossypha caffra*	11	7(3)	18(3)
Starred Robin [2, 3, 4]	*Pogonocichla stellata*	11(2)	12	23(2)
Barratt's Warbler [2, 3, 4]	*Bradypterus barratii*	–	12(4)	12(4)
Yellowthroated Warbler [2, 3, 4]	*Seicercus ruficapillus*	8(2)	4	12(2)
Barthroated Apalis [2, 3, 4]	*Apalis thoracica*	8(1)	17(5)	25(6)
Greenbacked Warbler [3, 4]	*Camaroptera brachyura*	3(3)	4	7(3)
Levaillant's Cisticola [1]	*Cisticola tinniens*	1	1	2
Lazy Cisticola [1]	*Cisticola aberrans*	1	–	1
Dusky Flycatcher [2, 4]	*Muscicapa adusta*	–	3	3
Cape Batis [3, 4]	*Batis capensis*	7(1)	15(3)	22(4)
Bluemantled Flycatcher [2, 3, 4]	*Trochocercus cyanomelas*	2	2	4
Paradise Flycatcher [4]	*Tersiphone viridis*	2	–	2
Cape Wagtail [1]	*Motacilla capensis*	–	1	1
Fiscal Shrike [1]	*Lanius collaris*	–	5	5
Southern Boubou [2, 4]	*Laniarius ferrugineus*	1	3	4
Puffback Shrike [2, 4]	*Dryoscopus cubla*	1	–	1
Redwinged Starling [1, 4]	*Onychognathus morio*	2	5	7
Gurneys Sugarbird [1, 4]	*Promerops gurneyi*	13(2)	10(4)	23(6)

(**Table 2** continued)

Species		Hlabeni	Ngele	Total
Malachite Sunbird [1, 4]	*Nectarinia famosa*	12(1)	–	12(1)
Lesser Doublecollared Sunbird [3, 4]	*Nectarinia chalybea*	12	20(2)	32(2)
Greater Doublecollared Sunbird [4]	*Nectarinia afra*	1	3(1)	4(1)
Black Sunbird [1, 4]	*Nectarinia amethystina*	13	9(1)	22(1)
Collared Sunbird [2, 3, 4]	*Anthreptes collaris*	1	5(2)	6(2)
Cape White-eye [4]	*Zosterops pallidus*	41(3)	89(4)	130(7)
Thickbilled Weaver [2, 4]	*Amblyospiza albifrons*	–	2	2
Forest Weaver [2, 3, 4]	*Ploceus bicolor*	–	3	3
Green Twinspot [3, 4]	*Mandingoa nitidula*	2	1	3
Redcollared Widow [1]	*Euplectes ardens*	1	–	1
Bluebilled Firefinch [1, 4]	*Lagonosticta rubricata*	–	2	2
Swee Waxbill [2, 3, 4]	*Estrilda melanotis*	–	4	4
Cape Canary [1, 4]	*Serinus canicollis*	8	–	8
Forest Canary [2, 3, 4]	*Serinus scotops*	5	24	29
Total		**233(22)**	**331(32)**	**564(54)**

The ringing data presented here is a portion of a long-term study and is presented in response to similar ringing efforts and studies on forest bird species (Dowsett 1985; Brosset 1990; Yom-Tov *et al.* 1994; Dranzoa 1997). Ringing effort varied at each session (a session being regarded as a period when nets were fully open for no longer than a day). Ringing occurred opportunistically at all times of the day from dawn to dusk.

The data from non-forest sites is included in the study because it was expected that forest-ringed birds would be recaptured at these non-forest sites (pers. obs.). Non-forest utilizing species were therefore also ringed for this study.

2. Forest utilizing species

Bird species lists for these two forests were recorded at Hlabeni forest and Ngele forest from 1993–1997 (Hlabeni forest: January 1993–December 1997; Ngele forest: December 1994–December 1997) (Keast 1990; Symes *et al.* in press). In this study any bird seen utilizing forest in any way (feeding, breeding, socialising, etc.) was recorded as a forest utilizing species (Skead 1964; Clancey 1975; Cody 1983; Oatley 1989; Keast 1990; D. Johnson pers. comm.; G. Castley pers. comm.).

RESULTS

1. Bird ringing

A total of 564 birds (233 at Hlabeni and 331 at Ngele) comprising 53 species were ringed (Table 2). This represents 46 (39.0%) (38 families) of 118 species (41 families) observed utilizing forest.

Forty-eight birds (8.4%) were recaptured within one month after initial ringing. Many of these were forest utilizing species (Table 3). Six birds were recaptured twice on separate occasions (Table 3). Twenty-two (66.7%) of 33 forest specific species observed were ringed (Table 2). Eighteen different species were recaptured (39.1% of total species caught), of which ten (55.6%) were forest specific species (Table 2).

Capture rates are summarized in Table 4. The capture rates of the two forest sites were compared and did not differ significantly (RM ANOVA; $F(1,27) = 4.09$; $p = 0.0531$). Other sites were not compared because of floristic differences (pers. obs.).

Table 3. Recaptures more than one month after first ringing (+indicates forest specific species (Oatley 1989), * indicates recapture of same individual).

Species		Months elapsed since ringed
Terrestrial Bulbul	*Phyllastrephus terrestris*	1, 5
Sombre Bulbul	*Andropadus importunus*	1*, 12*
Orange Thrush+	*Zoothera gurneyi*	8, 24
Chorister Robin+	*Cossypha dichroa*	1, 25
Cape Robin	*Cossypha caffra*	20, 20, 25
Starred Robin+	*Pogonocichla stellata*	9, 12
Barratt's Warbler+	*Bradypterus barrattii*	1*, 2*, 10**, 49**
Yellowthroated Warbler+	*Seicercus ruficapillus*	16, 20
Barthroated Apalis+	*Apalis thoracica*	1, 1, 1, 1, 2, 3*, 8, 10*
Greenbacked Warbler+	*Camaroptera brachyura*	19, 23*, 39*
Cape Batis+	*Batis capensis*	1, 2, 12, 19
Gurneys Sugarbird	*Promerops gurneyi*	1, 2, 2, 7, 20, 21
Malachite Sunbird	*Nectarinia famosa*	7
Lesser Doublecollared Sunbird+	*Nectarinia chalybea*	1, 18
Greater Doublecollared Sunbird	*Nectarinia afra*	8
Black Sunbird	*Nectarinia amethystina*	23
Collared Sunbird+	*Anthreptes collaris*	8, 25
Cape White-eye	*Zosterops pallidus*	9, 11*, 16, 16, 17, 17, 41*

2. Forest-utilizing species

A total of 118 bird species (108 at Hlabeni and 104 at Ngele) were observed utilizing forest habitat.

DISCUSSION

Selective ringing

Distribution of birds along a vertical gradient occurs with certain guilds foraging predominantly at certain strata within the forest (Koen 1988b; Brosset 1990). Although foraging height may vary within a species with foraging occurring closer to the ground when the undergrowth is better lit and at a higher level when the light is poor (Brosset 1990), usually under-storey avifauna differs from canopy avifauna (Loiselle 1990). Consequently mistnetting results may be irregular and selective (Brosset 1990) in relation to net positioning. In the present study netting in the forest was species selective. Species were captured at a net height of 0.5–2.0 m (height of nets in study), with mid-canopy and canopy avifauna being excluded e.g. Grey Cuckooshrike *Coracina caesia* (Table 2). Furthermore, because of the mesh size used, certain larger species were less likely to be held securely in the net e.g. Cinnamon Dove *Aplopelia larvata*.

Rare species were also captured infrequently. Karr (1990) captured over 90% of local species in a deciduous forest using mistnets. From 1972 to 1982, 33 forest bird species (2030 individual birds) were ringed on the Nyika Plateau, Malawi/Zambia (Dowsett 1985). By comparison, in this study 46 species (39.0%) of forest utilizing birds were caught (Table 2). Different size nets at all levels within the forest would therefore be required to sample a higher proportion of the species occurring in these forests. The high proportion of forest specific species ringed (66.7%) suggests that many of them rely on the under-storey in the forest. The presence of certain non-forest utilizing species in the list (Table 2) is a result of netting outside of the forest.

Table 4. Capture rates at respective ringing sites (birds caught per hour per 100 m net).

Ringing site	n (ringing sessions)	Birds caught per hour/100 m net (mean ± s.e.)
Hlabeni forest	28	1.97 ± 0.28
Hlabeni mountain (near stream)	5	2.23 ± 0.90
Hlabeni *Protea* patch	16	4.73 ± 0.72
Ngele forest	28	2.66 ± 0.28
Mackton Lodge	15	8.08 ± 3.50
SAFCOL Offices	11	6.78 ± 0.87

Capture rate

The capture rate was slow (Table 4), suggesting that forest birds active in the lower strata of these forests were able to detect and avoid nets effectively, or did not cover wide ranges in the forests. At the non-forest sites the higher capture rates suggest higher activity patterns for alternative habitats. In Ghana, composition and relative abundance in mistnet captures varied depending on net height, with the highest catch recorded in the third shelf (Ntiamoa-Baidu *et al.* 2000a).

The recapture rate of 8.4% after 57 months suggests that future results will yield valuable longevity data for forest specific species. Such data is scarce for many of the species captured in the study. In Ziika forest, Uganda, a 15.6% recapture rate five years later with 26% of species captured being recovered suggests higher annual survival rates than was expected for tropical birds (Dranzoa 1997). Recaptures in Nyika suggest longevity of more than11 years for forest birds similar to those of this study (Dowsett 1985).

Species presence data

Nine and six species in Atewa Range Forest Reserve and Tano-Offin Forest Reserve respectively, not recorded in spot counts were caught in mistnets (Ntiamoa-Baidu *et al.* 2000a). Spot counts are the most comprehensive method of rapid assessment of forest bird species diversity, but a combination of methods is necessary for complete coverage (Koen 1988b; Ntiamoa-Baidu *et al.* 2000b). Mistnetting, therefore, cannot be used as a method to census birds. However, it can be used to supplement data. In this study the presence of specific cryptic and rare species was often recorded as a result of mistnetting e.g. Orange Thrush, Barratt's Warbler, and Green Twinspot.

Edge effects are pronounced in South African forests due to their small size in comparison to forests of the equatorial regions (Oatley 1989). Furthermore, their naturally fragmented nature creates distinct edge effects with grassland and afforested areas. As a result many non-forest species utilise forest edges (Skead 1964; Cody 1983; Koen 1988a; Koen 1992). Definitions and requirements of 'true forest species' also affect these interpretations with some authors less strict in their classification of forest species (Clancey 1975; Skead 1964). Species that use forest margins and other altered forest interior habitats are thus included as forest species (Skead 1964; Maclean 1993). Various southern African afromontane forest avian community studies have included non-forest specific species (Winterbottom 1968, 1974; Clancey 1975; Cody 1983; Cooper 1985; Earlé 1983; Koen 1988a, b, 1992). Forest utilizing species were caught at non-forest sites and *vice versa* (Table 2). The recapture of predominantly forest specific species (55.6%) at the forest sites suggests high site fidelity for forest specific species.

Importance of forest

Although forest only covers 0.25% of the land surface of South Africa (Cooper 1985) a total of 41 species (approximately 6.5% of South Africa's total avifauna excluding predominantly marine species) are classified as true forest specific species (Oatley 1989). Such species are described as unable to survive in non-forest habitats (Oatley 1989). This represents a high habitat specificity: habitat area ratio. Skead (1964) includes 42 species as being '. . . birds of the forest proper . . .' in the eastern Cape Province, South Africa. High levels of diversity and levels of endemism ranging from 3.4% to 40.0% (Stuart *et al.* 1993) in African Montane Forest Groups studied in east Africa correspond to refugia where forest would have survived during the driest periods of the Pleistocene (Diamond & Hamilton 1980; Deacon & Lancaster 1988). South African avian endemism is generally low (Pomeroy 1993), yet a high proportion (30.0%) of forest specific birds were recorded, of which 10 (30.3%) were southern African endemics or near endemics (Clancey 1975; Clancey 1986; Allan 1997). This high level of specificity for endemics suggests that forests may have in the past occupied a larger area than today. Since the last Glacial Maximum forest fragments would have formed forest refugia in which such isolation and speciation could have occurred (Lack 1971). Degrees of speciation would depend on periods of isolation (Mayr 1963; Lack 1971). No forest specific birds in this study belong to endemic families for the region, suggesting that periods of isolation may have not been long enough to warrant speciation to the ordinal level of family.

The maintenance of diversity of forest interior birds requires the preservation of large areas of forest (Askins *et al.* 1987). Forest area is the best predictor of density and species richness of forest interior birds, while forest isolation the best predictor for large forests (Askins *et al.* 1987). However, disturbed forest attracting generalists and excluding specialists may result in a distorted view of the importance of an area if diversity is the criterion. The importance of long term monitoring programs in forests as part of management priorities in dwindling forests is thus highlighted (Dranzoa 1997).

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Notice:

Antarctic Tern *Sterna vittata*

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The Antarctic Tern is a regular winter visitor to South Africa. The first birds arrive in about March, and numbers build up to a peak in August. Departure takes place mainly in September and October, and is complete by November, with only isolated birds remaining in South Africa for the summer months. Regular roosts lie between Lamberts Bay and Cape Agulhas and between Cape St Francis and Bird Island, Algoa Bay. Beyond these areas it is a vagrant.

Prior to 1998, 249 Antarctic Terns had been ringed. These delivered five remarkable recoveries (see *Review of ring recoveries of waterbirds in southern Africa* by Underhill *et al.*, 1999).

Between July 1998 and September 2000, several expeditions to ring Antarctic Terns have been made to Bird Island, Algoa Bay. More than 1000 terns have been ringed, and colour leg flags were also fitted to 600 of these birds. A request to look out for these birds was made in September 2000 to all researchers visiting Southern Ocean islands. Within three months there was an exciting response. Eric Woehler of the Australian Antarctic Division saw one of these leg-flagged birds between Christmas and New Year on Heard Island. This is at 53°S 73°E, in the southern Indian Ocean and 4300 km from Bird Island.

If you have access to a roost, please scan each bird for leg flags. If any sightings of these birds are made, report them to the South African Bird Ringing Unit. In fact, all sightings of Antarctic Terns, either at sea or at roosts, can usefully be reported to the ADU's Bird Sightings system.

For more information see the ADU webpage: *www.uct.ac.za/depts/stats/adu* under Seabirds; Antarctic Terns.