

Distribution and population size of the Sokoke Scops Owl *Otus ireneae* in the Arabuko-Sokoke forest, Kenya.

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ABSTRACT

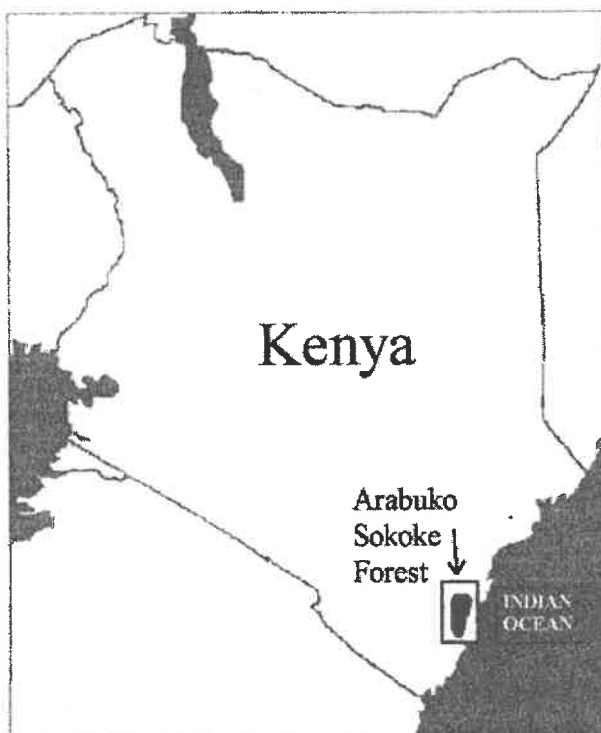
The Sokoke Scops Owl *Otus ireneae* is known only from the Arabuko-Sokoke forest, Kenya and the foothill forests of the east Usambara mountains in Tanzania. The Arabuko-Sokoke forest is ranked as the second most important forest in mainland Africa for bird conservation. The forest faces many threats, among them the clearing of its valuable trees and proposed forest excisions to settle the growing local human population. These threats pose a potential risk to the Sokoke Scops Owl as its numbers were believed to be on the decline. An ecological study was conducted on the species in 1993. Call-playback surveys were used to study the owls' distribution and population size. The owls were mainly found in dense *Cynometra* woodland where they occurred at densities of about 7 pairs/km². They occurred at lower densities in adjacent habitats with a lower canopy height. The total owl population in the forest was estimated at 1000 pairs. Based on this study, the owls' status was downlisted from endangered to its present status, vulnerable. Follow-up census studies to monitor the owls are urgently required as illegal logging in the forest continues unabated. This study recommends a two-yearly census of the owls in the forest as part of a long-term monitoring programme.

INTRODUCTION

The Sokoke Scops Owl *Otus ireneae* was discovered in 1965 when a specimen was collected during an American Museum expedition to the Arabuko-Sokoke forest (Ripley 1966). In Kenya, the owl is found only in the Arabuko-Sokoke forest, a vestige of the coastal forest that once stretched along the entire coastline of East Africa (Fig 1). Arabuko-Sokoke forest is a vital refuge for a large number of rare and threatened animals and is ranked as the second most important forest in mainland Africa for bird conservation (Collar & Stuart 1985). The Sokoke Scops Owl occurs mainly in the *Cynometra-Manilkara-Brachylaena* (now referred to as *Cynometra*) woodland habitat type found along the western half of the forest (Britton & Zimmerman 1979). The species also occurs in the foothill forests of the east Usambara mountains in Tanzania, and this has led to speculation that the owls may have once ranged throughout suitable habitat along the East African coast (Fanshawe 1993; Hipkiss *et al.*, 1993).

The Arabuko-Sokoke forest faced a major threat from clearance of its valuable timber trees, which seemed to negatively affect the owl population (Kelsey & Langton 1984). A reliable assessment of the owls' conservation status was difficult since virtually nothing was known of the biology of this rare species. Information gathered about a species' distribution and density has been critical in the implementation of successful management and conservation policies aimed at ensuring the survival of viable populations (Wood 1991).

Figure 1. Map of Kenya showing position of Arabuko-Sokoke forest



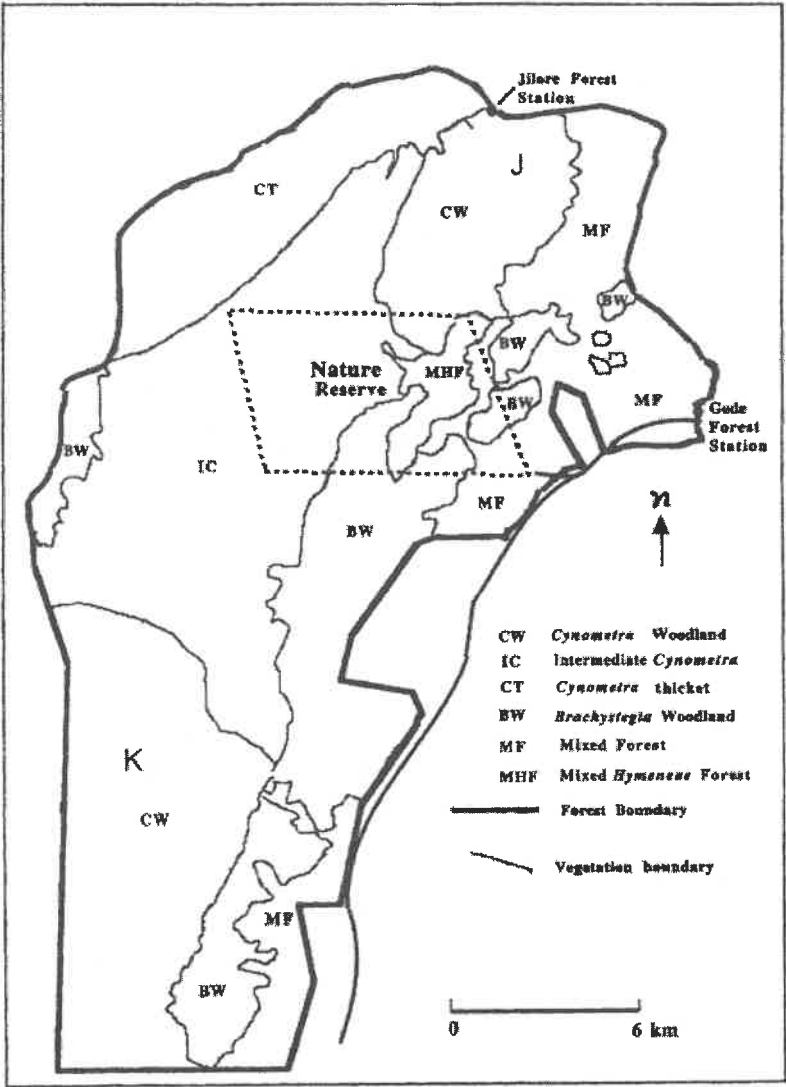
An ecological study of the Sokoke Scops Owl was conducted in the Arabuko-Sokoke forest between February and December 1993 (Virani 1995). The aims were to understand the owls' ecological requirements specifically with respect to distribution and abundance, behaviour and habitat use. Information gathered would be used to maintain or improve the status of the Sokoke Scops Owl throughout its range (Virani 1995; Virani this volume). This paper presents results on the distribution, density and population size of the owls in the forest.

STUDY AREA AND METHODS

The study was conducted in all the different forest types of the Arabuko-Sokoke forest (Virani 1995) (Fig 2). These are mixed forest, mixed *Hymenaea* forest, *Brachystegia* woodland and *Cynometra* woodland (Fig 1). Mixed forest and mixed *Hymenaea* forest are semi-deciduous type forests occurring on white sandy soils with a canopy height of about 10-12 m (Britton & Zimmerman 1979; Kelsey & Langton 1984). *Brachystegia* woodland is more open woodland dominated by *Brachystegia spiciformis* trees up to 18 m high. This woodland, which also occurs on white sandy soils, forms a

narrow belt running from the southern to the northern part of the forest (Fig 2). The *Cynometra* woodland lies on red Margarini sands and is further divided into woodland, intermediate woodland and thicket. This sub-division was necessitated due to the different canopy heights of the dominant *Cynometra webberi* trees. The *Cynometra* woodland which occurs in two separate regions of the forest (Fig 2) has an average canopy height of about 15 m, whilst the intermediate *Cynometra* and the *Cynometra* thicket have canopy heights of 7 m and 4 m respectively (Virani 1995; Kelsey & Langton 1984; Britton & Zimmerman 1979). In *Cynometra* woodland, the illegal removal of *Brachylaena huillensis*, a strong hardwood tree, much sought after by wood carvers, is believed to have a negative impact on the owl population as the tree is considered a potential nesting site for the owls due to the numerous holes and cavities in it (Kelsey & Langton 1984).

Figure 2. Map of Arabuko-Sokoke forest showing various forest habitat types.



Nocturnal call surveys were conducted between April 1 and June 7 1993. Two blocks of *Cynometra* woodland (J and K), in the north and south of the forest were selected as prime locations for conducting call surveys, while supplementary study sites were selected in the intermediate *Cynometra* and mixed *Hymenaea* forests (Fig 2). Owl surveys based on call-playback (Southern 1954) were conducted in representative areas of all the habitat types of the Arabuko-Sokoke forest which were accessible by vehicle. Call surveys involved walking transects and playing-back owl calls. Six 1-km long transects were chosen at locations J and K respectively (A-F) while supplementary 1-km long transects were chosen in intermediate *Cynometra* (a-f) and mixed *Hymenaea* forest (mhfD) (Fig 3). One-minute-long owl calls were played at each transect at intervals of 200 m and owls responding in the ensuing 5 minutes were recorded. This exercise was repeated at each transect point. Based on the work of Kelsey & Langton (1984), each responding owl was considered to be a territorial male and hence representing a pair. Prior to commencement of owl surveys, we spent two weeks familiarizing ourselves with owl responses and estimated that the maximum distance an owl could be heard from was 250 m. Thus all responses heard in an area of 1 km by 0.5 km gave a reasonable indication of owl density. Owl distribution patterns in the forest were determined by presence or absence of responding owls (all species of owls heard were recorded) while owl population density (based on four replicates of 6 transects per location) was calculated using the method described by Kendeigh (1944) and Emlen (1974). All transect counts were conducted on calm, clear nights. It was assumed that the owls responded to play-back calls irrespective of the time of the night or the stages of the moon.

RESULTS AND DISCUSSION

General distribution of owl species

Sokoke Scops Owls occurred throughout the *Cynometra* woodland habitats to the north-east and south-west parts of the forest (Fig 3). They were also patchily present in mixed *Hymenaea* forest and in the intermediate *Cynometra* habitat. Sokoke Scops Owls were not recorded in *Cynometra* thicket to the north-west of the forest nor in any plantation areas adjacent to *Cynometra* woodland or thicket. They were not present in *Brachystegia* woodland and hence the collection of the type specimen in *Brachystegia* woodland is considered as anomalous (Kelsey & Langton 1984).

Barred Owlets *Glaucidium capense* were dominant in the *Brachystegia* woodland while a few responses were recorded in the peripheries of *Cynometra* thicket and intermediate *Cynometra* (Fig 3). The Sokoke Scops Owl and the Barred Owlet were heard calling together in the intermediate *Cynometra*.

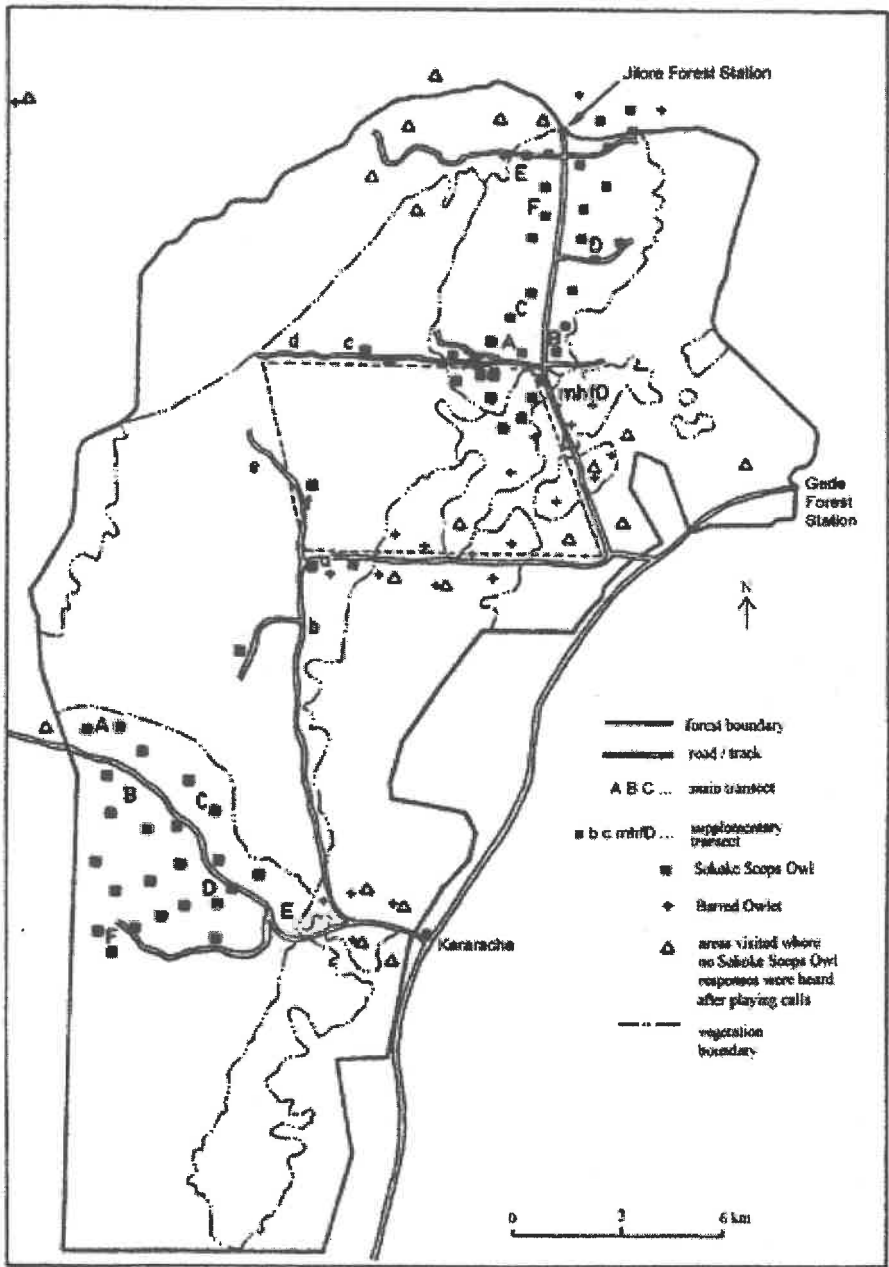
African Wood Owls *Strix woodfordii* were present in all habitat types of the forest and in surrounding plantations, while Verreaux's Eagle Owls *Bubo lacteus* were present only in the *Brachystegia* woodland and in the mixed forest. One Barn Owl *Tyto alba* was recorded in the *Cynometra* woodland.

The presence of Sokoke Scops Owls in intermediate *Cynometra* and mixed *Hymenaea* forest confirmed earlier suggestions that these areas might hold owls (Kelsey & Langton 1984). The distribution of Sokoke Scops Owls and Barred Owlets was remarkably disjunct although overlap was observed in degraded areas around the edges of *Cynometra* woodland and in intermediate *Cynometra*.

Population density and size

In the northern and southern parts of the *Cynometra* woodland, the Sokoke Scops Owls occurred at densities of 7.3 pairs/km² (s.d = 0.80) and 6.9 pairs/km² (s.d = 1.01) respectively. These densities did not differ significantly (Mann-Whitney U = 569.0, $p > 0.05$) and hence the overall mean density of the owls in *Cynometra* woodland was calculated at 7.1 pairs/km² ($n = 44$, 95% limits: 6.1 – 8.0). In intermediate *Cynometra* and mixed *Hymenaea* forest, the owls occurred at densities of 1.2 pairs/km² ($n = 7$, 95% limits: 0.00 – 3.31) and 3.0 pairs/km² ($n = 7$, 95% limits: 2.37 – 3.58) respectively. There was no significant difference between the mean population density of owls in these two habitats although the p value obtained was small (Mann-Whitney U = 29.0, $p = 0.06$).

Figure 3. Locations of vocal responses (and non- responses) of Sokoke Scops Owls and Barred Owlets in visted areas of the Arabuko-Sokoke forest, 1993.



The Sokoke Scops Owl population size was estimated by extrapolating the population density estimates obtained from transect surveys. Since all forest types were homogenous, this extrapolation assumed that owl pairs were uniformly distributed in their habitats. Based on density estimates and

areas of available habitat, the population size of Sokoke Scops Owls was estimated at 750 pairs in *Cynometra* woodland, 250 pairs in intermediate *Cynometra* and about 25 pairs in mixed *Hymenaea* forest giving a total of 1025 pairs in the entire forest (Table 1). The small *p* value (0.06) obtained for the differences in owl density between intermediate *Cynometra* and mixed *Hymenaea* forest suggest that fewer owls may be present in intermediate *Cynometra* than the estimated number.

Table 1. Areas of various habitat types showing mean and maximum (based on upper 95% limits) densities and population size of Sokoke Scops Owls in the Arabuko-Sokoke forest, Kenya, 1993.

Habitat Type	Area (km ²)	Density (pairs/km ²)	Total (pairs)	Maximum (pairs)
<i>Cynometra</i> woodland	99	7.1	703	796
Intermediate <i>Cynometra</i>	113	1.2	136	374
Mixed <i>Hymenaea</i> forest	7	3.0	21	26
Total	219		860	1196

The owl density estimate of 7.1 pairs/km² in *Cynometra* woodland compares to previous density estimates of 7-8 pairs/km² (Britton & Zimmerman 1979; Kelsey & Langton 1984). The lower density estimates of the owls in intermediate *Cynometra* and mixed *Hymenaea* forest may be due to the "lower" quality of these habitats compared to *Cynometra* woodland. *Cynometra* woodland appeared to provide the owls with a higher quality habitat than did intermediate *Cynometra* which had a lower canopy height, fewer mature trees and evidence of more scattered stumps which gave the impression of an altered woodland. Lower densities of Sokoke Scops Owls have also been associated with heavily-degraded areas, such as the lowland forests of the East Usambara mountains in Tanzania (Evans 1997).

Sokoke Scops Owl densities in the *Cynometra* woodland appear to have remained stable for many years. However, reduction in area of this suitable owl habitat from 111 km² (Kelsey & Langton 1984) to 99 km² (Virani 1995) may indicate that the population (in suitable habitat) may have only slightly declined as forest clearance continued. Based on the findings of this study, the conservation status of the Sokoke Scops Owl was downlisted from endangered to its present status, vulnerable (Collar *et al.*, 1994).

At the time of writing, no follow-up census studies have been conducted on the owls in the forest. The Arabuko-Sokoke forest continues to be under tremendous pressure from adjacent (densely populated) villages, mainly for settlement. Illegal logging practices continue to be on the increase, while the recent discovery of large Titanium deposits along the east African coastal forests may exert further pressure on Arabuko-Sokoke (D. Obura, pers comm.). Local and international conservationists have fought hard against the de-gazettement of 3000 ha proposed for excision in the southern part of the forest. The survival of the Arabuko-Sokoke forest will depend on a firm commitment by local conservation groups, conservation-minded villagers and strong political will by authorities in charge. The success of community based conservation projects such as the involvement of local villagers to farm butterflies for export (Kipepeo Project) and the formation of a local bird-guide association has provided some financial incentives for local villagers to conserve the forest. This study recommends a two-yearly census of the owls in the forest as part of a long-term monitoring programme.

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REFERENCES

- BRITTON, P.A. & D.L. ZIMMERMAN. 1979. The avifauna of Sokoke Forest, Kenya. *J. Ea. Afr. Nat. Hist. Soc. and Nat. Mus.* 169:1-15.
- COLLAR, N.J. & S.N. STUART. 1985. Threatened Birds of Africa and related islands: the ICBP/IUCN Red Data Book. *ICBP/IUCN*, Cambridge, U.K.
- COLLAR, N.J., M.J. CROSBY & A.J. STATTERSFIELD. 1994. Birds to Watch 2. The world list of threatened birds. Birdlife Conserv. Ser. No. 4. Birdlife International, Cambridge U.K.
- EMLEN, J.T. 1974. An urban bird community in Tucson, Arizona: deviation, structure, regulation. *Condor* 76:184-197.
- EVANS, T. 1997. Preliminary estimates of the population density of the Sokoke Scops Owl *Otus ireneae* Ripley in the East Usambara lowlands, Tanzania. *Afr. J. Ecol.* 35:303-311.
- FANSHAWE, J. 1993. Sokoke Scops Owl. *World Birdwatch* 15:18-19.
- HIPKISS, A.J., L.G. WATSON & T. D. EVANS. 1994. The Cambridge-Tanzania Rainforest Project 1992. Brief account of ornithological results and conservation proposals. *Ibis* 136:107-108.
- KELSEY, M.G. & T.E.S. LANGTON. 1984. The conservation of Arabuko-Sokoke forest, Kenya. *ICBP Study Report No. 4*. Cambridge, U.K.:ICBP.
- KENDEIGH, S.C. 1944. Measurement of bird populations. *Ecological Monographs* 14:67-106.
- SOUTHERN, H.N. 1954. Tawny Owls and their prey. *Ibis* 96:384-408.
- RIPLEY, S.D. 1966. A notable owlet from Kenya. *Ibis* 108:136-137.
- VIRANI, M.Z. 1995. Ecology of the endangered Sokoke Scops Owl *Otus ireneae*. M.Sc. thesis, Dept. of Biology, University of Leicester U.K.
- WOOD, G.W. 1991. Owl conservation strategy flawed. *J. of Forest.* 89:39-41.

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