

Raptor Studies in Kenya: Past, Present and Future

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INTRODUCTION

Kenya supports one of the richest avifaunas in Africa and contains a mosaic of different habitats determined by altitude and rainfall distribution. This natural spectrum includes montane forests, dry and moist forests, woodlands, savannah grasslands, scrublands, deserts, marshes and mangroves. These diverse habitats support a total of 75 species of diurnal birds of prey and 16 of nocturnal owls - a raptor richness that is among the highest of any country in the world.

In contrast to its rich natural resources, Kenya also has one of the highest human population growth rates in the world and a severely limited area of fertile land. Nearly eighty-eight percent of Kenya's human population is directly dependent on rain-fed agriculture (IUCN 1992). Furthermore, small-scale subsistence agriculture and livestock grazing is the most prevalent land-use throughout much of Kenya (Sorley & Andersen 1994). This has resulted in many of its areas exceeding their carrying capacity (KNR 1972). As a result, the country has reached a situation where land-use interests such as agriculture, tourism, ranching, wildlife management, forestry and water conservation - each of them valid and nationally productive usages of land - are in competition and often in conflict over large areas of the country. Not only are various arms of the Government in disagreement or confusion on these issues, but the problem is compounded by the demands of the landless, burgeoning population which are haphazardly realised in the absence of clear policies. This lack of land-use policy has clearly affected the country's wildlife resources. For example between the period from 1920 to 1970, this resource had, as a direct result of increasing human pressure, been depleted by as much as 50% (KNR 1972). Raptor abundance and diversity have also suffered as a result of increasing human population pressure. For example, a recent survey on raptor abundance in south-central Kenya in relation to land-use patterns showed that differences in land-use practices between undisturbed and man-altered habitats are directly responsible for significant changes in raptor community structure (species richness, density and species identity) related to human land-use (Sorley & Andersen 1994).

There is an urgent need for a clear-cut national policy on land and habitat use that should aim to protect the country's precious wildlife resources, while at the same time meeting the needs of the local people. Understanding the ecological requirements of key indicator species that are sensitive to habitat change can bring about effective land-use policies based on sound conservation principles. Raptor studies have been used as effective tools for conservation in a number of projects around the world (e.g. Peregrine Falcon - USA; Mauritius Kestrel - Mauritius; Madagascar Fish Eagle - Madagascar) (Burnham *et al.* 1992). In the East African region, information obtained from

ecologically-based raptor studies can be used to achieve conservation goals. For example, a study on the ecology of raptors in the Impenetrable Forest in Uganda provided vital information on seven raptor species and, in consequence, aided in the long-term conservation policy of the forest (Muhweezi 1990). In order to achieve conservation using raptors as indicators, knowledge about their basic ecology is vital. However, there is a large gap in the knowledge about the basic ecology of most raptors in the East African region. In a recent study on the state of ecological knowledge and conservation status of raptors in Africa, almost 61% of raptors were rated as poorly understood in aspects of distribution, population dynamics, breeding biology and feeding ecology (Virani & Watson 1998). Furthermore, in a recently compiled list of East African birds in jeopardy, almost 40% of all the breeding raptors that occur in the East African region ($n = 79$) have been listed as either Endangered (1), Vulnerable (14) or Near Threatened (15) (Bennun & Njoroge 1996). Thus a lack of sufficient knowledge about the basic biology of East African raptors, coupled with their high local conservation importance, has fuelled the need to better understand the basic ecological requirements of key raptor species. Raptor studies are thus an ideal tool to focus on conservation strategies, especially in areas prone to changes in habitat, both natural and anthropogenic (see Reichholf 1974; Watson 1991; Thiollay 1992; Burnham *et al.* 1992; Virani & Watson 1998).

The aims of this paper are a) to outline the steps taken in the revival of raptor studies in Kenya, b) to highlight some of the raptor studies recently and currently conducted in Kenya, and c) to discuss the direction and future of raptor research and conservation in Kenya.

REVIVAL OF RAPTOR STUDIES IN KENYA

Prior to 1980, the late Leslie Brown published almost a quarter of all that is known about raptors in Africa (Virani & Watson 1998) and thus provided a solid framework to build on for future raptor studies. The majority of his fieldwork was conducted in Kenya, and his classical studies on the African Fish Eagle *Haliaeetus vocifer* at Lake Naivasha and the eagles of Embu Hill are still being referred to at this date. Sadly, after his death in 1980, raptor studies in Kenya came to a virtual halt, save for a handful of raptor enthusiasts who continued watching and enjoying Kenya's raptors. Small-scale raptor studies were also conducted intermittently by overseas researchers, including distribution studies on the African Fish Eagle (Cambridge University 1979; Reading University 1986; Smart 1991), distribution and density survey of the Sokoke Scops Owl *Otus ireneae* (Kelsey & Langton 1984), pesticide studies (Lincer *et al.* 1981), just to mention a few. These studies were short, spanning a few days, or were part of an overall expedition focussing more on other aspects such as vegetation analysis or species counts. There was still an urgent need for a focused, more co-ordinated study on individual raptor species threatened by anthropogenic impacts.

In 1992, exactly 12 years after the demise of Leslie Brown, the Peregrine Fund Inc., World Center for Birds of Prey, included Kenya in its Pan-African Raptor Conservation Project. The Kenya Project, initiated by Rick Watson (Programme Director, Africa and Madagascar), was modelled after the Peregrine Fund's successful partnerships in the Philippines and Madagascar, where a focus on birds of prey is used to achieve conservation goals. The main aim in Kenya was to develop national expertise and ability to achieve conservation of biodiversity. This would be achieved by gathering important ecological and socio-economic information on which to base conservation and management interventions that are specific to the unique problems of each target site. Under a joint memorandum of understanding with the National Museums of Kenya (NMK), and under the managership of local raptor expert Simon Thomsett, the Peregrine Fund's Kenya Project was initiated. Over the last six years, three students have undergone post-graduate training in raptor biology. In addition, self-supporting overseas students have been encouraged to help in on-going or independent raptor projects (see below).

KEY-SITES OF RAPTOR STUDIES IN KENYA

Raptor research activities in Kenya have focused on three important sites, the Arabuko-Sokoke forest along the Kenyan coast (ranked as the second most important forest in mainland Africa for

bird conservation by Collar and Stuart (1985)), the Lake Naivasha area in the Great Rift Valley (now declared a Ramsar site), and the Athi-Kapiti grasslands south-east of Nairobi (Fig 1).

Figure1. Map of Kenya showing major sites of raptor reserved activities.



Arabuko-Sokoke forest

The Arabuko-Sokoke forest contains the greatest area of natural complete forest cover in coastal Kenya (Robertson & Luke 1993). It covers an area of 372 km² and is a vestige of the coastal forest that once stretched along the entire coastline of East Africa (KIFCON 1994). The forest is a vital habitat for a number of endangered and rare species of animals, among them the Sokoke Scops Owl which is virtually confined to the *Cynometra* woodland habitat within the forest. As the forest faced a major threat from increased clearance of its valuable timber trees, it was believed that the owl population might be further threatened (Kelsey & Langton 1984). In 1993, a year-long study on the ecology of the Sokoke Scops Owl commenced. The aims were to better understand the owls' ecological requirements so that an effective conservation and management plan could be implemented to ensure the species' survival (see Virani 1995; Virani *this proceedings*; Virani *in press*). A distribution and density survey of the Banded Owlet *Glaucidium capense*, in relation to the Sokoke Scops Owl, was also conducted (Virani & Tarpley *in litt.*).

Lake Naivasha

Lake Naivasha, Kenya's largest freshwater lake, is located in the Great Rift Valley. The lake covers an area of about 120km² and has a shoreline of approximately 50 km (Melack 1979). The Lake Naivasha area has always been an important ecological site to Kenya (Harper *et al.* 1990). Its diversity of flora and fauna, and the range of vegetation-zones associated with the lake and its hinterland, is greater than that of other Rift Valley lakes (Lincer *et al.* 1981). This importance has been maintained even though the lake has no statutory protection or reserve status. In 1995, the lake was recognised as a Ramsar wetland site of international importance.

The Lake Naivasha area has a high economic value; it is the fount of Kenya's upcoming horticultural industry. The lake's waters irrigate thousands of hectares of fertile volcanic loam which burgeon with vegetables and flowers. The lake area is also a focus for tourism (particularly bird watching) and recreation (boating and sport fishing) which earn the country foreign exchange. In addition, a commercial fishery has also been built up over the past 30 years on the basis of introduced species, the products being transported to Nairobi and Nakuru in addition to local consumption (Harper *et al.* 1990). The area is also industrially significant as a consequence of the development of Olkaria, just to the south of the lake, a geothermal energy generation site that produces about 43 megawatts (15%) of Kenya's total energy consumption (Harper *et al.* 1990).

The lake has experienced, over the years, tremendous fluctuations in water level, plant structure, animal populations and nutrient composition. The increasing human population around the lake has resulted in clearing of riparian forests along the lake shore for agriculture and settlement. The recent proliferation of flower and other horticultural enterprises has accelerated this trend, which in turn may have had an impact on the flora and fauna of the lake and its environs.

In order to determine whether the rapid changes in land use patterns around the Lake Naivasha area are having a significant impact on the animal communities, a study focusing on the ecological requirements of the Augur Buzzard *Buteo augur*, Egyptian Vulture *Neophron percnopterus* and African Fish Eagle was initiated.

The Athi-Kapiti plains

The Athi-Kapiti plains are ecologically linked to Nairobi National Park and are an important migratory corridor for the thousands of plains game that occur in the park. The plains consist of rolling savannah grasslands, riverine woodland, man-made dams and rocky gorges. The area is an important migratory route for Lesser Kestrels *Falco naumanni* and other migrating birds. The migratory patterns of plains game animals are becoming increasingly constrained by sprawling settlements and industrial development on the Athi-Kapiti plains. The plains were originally set aside as a game conservation area, but land hunger around Nairobi became acute in the 1970s and people were allowed to settle there. This resulted in ranches being fenced off, small-scale agricultural plots mushroomed and human-wildlife conflicts became intense.

A study on the Martial Eagle *Polemaetus bellicosus*, commenced in 1996, aims to determine the ranging patterns and habitat utilisation of the eagle in order to determine the impacts of rapidly changing land-use patterns on the birds' ecology.

HIGHLIGHTS OF CURRENT AND RECENT RAPTOR STUDIES IN KENYA

Sokoke Scops Owl (Virani 1995)

A study of the Sokoke Scops Owl was conducted between January and December 1993. Elicited-call surveys were used to determine the owls' distribution, abundance and calling behaviour, while radio-telemetry was used to study the owls' home range and movement patterns. Owl pellets were also collected to determine their contents.

The owls were found mainly in the dense *Cynometra* woodland, where they occurred at a density of 7 pairs/km². They occurred at lower densities in adjacent habitats of lower canopy height. The

total owl population in the forest was estimated at 1,000 pairs. Three neighbouring owl pairs were radio-tracked for a month-long period each. They occupied exclusive territories of about 12-14 ha, roosting and foraging mainly within the lower canopy level of *Cynometra* woodland. Owl activity was linked with lunar cycles, as they tended to forage nearer to their roosts and travel smaller distances on moonlit nights. Calling activity was significantly higher during the first quarter and full moon phase. Most calling activity and movement took place two hours after dusk and two hours before dawn. Females were found to be 20% heavier than males. Based on pellet analysis, the owls fed almost entirely on insects. As a result of the Sokoke Scops Owl study, the status of the owl was downlisted from endangered to its present status of vulnerable (Collar *et al.* 1994).

Barred Owlet (Virani & Tarpley *in litt.*)

Barred Owlet surveys in Arabuko-Sokoke forest were conducted between October and December 1993. The owlets were found mainly in the *Brachystegia* woodland and intermediate *Cynometra* woodland. The interest in the distribution of the owlet stems from a hypothesis of mutual exclusivity with the Sokoke Scops Owl. Both owl species co-existed in the intermediate *Cynometra* woodland, although at much lower densities than in their preferred habitats. Barred Owlets occurred at a density of 4.4 pairs/km² in *Brachystegia* woodland and their total population size in the forest was estimated to be about 300 pairs.

Augur Buzzard (Virani *in litt.*)

The Augur Buzzard study was conducted between January 1995 to January 1998. The aims were to determine the impacts of different land-uses on the ecology of the species. Populations of Augur Buzzards were studied in three different land-use areas; Hell's Gate National Park, undisturbed *Acacia* woodland and agricultural areas. Productivity of Augur Buzzards was highest in undisturbed *Acacia* woodland (1.32 chicks/pair/year) and lowest in agricultural areas and Hell's Gate National Park (0.64 and 0.53 chicks/pair/year respectively). Mortality rates were lowest in undisturbed *Acacia* woodland and highest in agricultural areas. Forty percent of mortality (n = 15) was a result of human persecution and poisoning. Rainfall did not influence timing of laying, although 76.4% of pairs (n = 74 pairs over 3 years) laid between April and September of each year. The diet of Augur Buzzards comprised mainly rodents (74.4%) while birds (6.4%), reptiles (3.9%), dassies (3.8%) and arthropods (1.3%) formed the rest. Prey delivery rates to the nest differed at different stages of the nestling period as well as when there was more than one chick in the nest.

African Fish Eagle (Virani & Harper *in litt.*; Virani *et al.* *in litt.*)

Prompted by previous data on population size of the African Fish Eagle at Lake Naivasha (Brown & Hopcraft 1973; Cambridge University 1979; Reading University 1986, Smart 1991; and African Waterfowl Census 1990-1993), an ongoing study on the eagles began in April 1994 (Virani *et al.* 1997; Parsons 1997; Virani & Harper *in litt.*). The aims of the study were to compare present-day fish eagle population size with that which existed in the early 1970s, and to correlate population trends with parameters such as lake-levels, transparency, prey availability and habitat parameters.

The population of the African Fish Eagle has declined by around 50% since 1970, to around 110 adults (all territory-holding pairs). Proportions of juveniles:adults have declined from 20% to 4% over the same period. At present, shoreline density ranges from 2.6 adults/km (western shore with mature trees, continuous papyrus fringe and rocky hinterland) to 0.6 adults/km (eastern shore with intensively farmed riparian edge, degraded papyrus and no trees). The overall decline in adults has been caused by loss of about one-third of the shoreline since the lake has receded after 1970, exacerbated by degradation of fringing papyrus vegetation around half the shoreline through various forms of human activity. Decline in productivity has been caused by reduction in available food. Appropriate-sized fish have declined through over-fishing and higher levels of sediment and phytoplankton growth have reduced water transparency. Appropriate-sized birds have almost disappeared, following a catastrophic decline in aquatic littoral plants. A total of 37 fish eagles have been trapped and measured. Females weighed 2.30-3.31 kg (mean 2.99, n = 20); males 2.10 - 2.65

kg (mean 2.34, $n = 17$). The mean weight of female birds was lower than those published in existing literature (Brown *et al.*, 1982) suggesting that they may be catching just enough food to maintain body weight but not enough to sustain breeding. In 1997, only four active nests existed. The most effective conservation measure for the eagle will be effective management of the fishery.

A new study to determine the nest-site characteristics of the eagles began in July 1998 (Virani *et al. in litt.*). A total of twenty nests and twenty random sites have been quantified. Data are presently being analysed.

Martial Eagle (Ong *in litt.*)

A study on the home range and habitat use of the Martial Eagle on the Athi-Kapiti plains was conducted between October 1996 and October 1997, and at the time of writing C. Ong was writing up her thesis. A total of six Martial Eagles from three adjacent pairs were radio-tagged and tracked during this period. Data were also obtained on their nest-site characteristics, breeding success and diet (analysed from prey remains found beneath nests).

Egyptian Vulture (Mburu *in litt.*)

The ecology of the Egyptian Vulture was studied in the southern Lake Naivasha area and, at the time of writing, B. Mburu had completed his field work. He observed a total of five adjacent pairs and focused mainly on aspects of breeding biology and ranging patterns.

Other raptor projects

Since 1992, a number of other projects have been proposed and/or conducted. These include 1) collection of blood and muscle tissues from various raptors in the Rift Valley for the analysis of organo-chlorine residues (Thomsett *in litt.*), 2) raptor road counts in the Rift Valley region and along the Nairobi-Mombasa road (Virani *in press.*), and 3) re-introduction of the Bearded Vulture *Gypaetus barbatus* in Hell's Gate National Park (Thomsett, pers comm.).

THE FUTURE OF RAPTOR CONSERVATION IN KENYA

The revival of raptor research activities in Kenya has provided a firm platform on which to base future conservation work. International organisations such as the Peregrine Fund Inc. – World Center for Birds of Prey (USA), Earthwatch Institute (USA) and the Aga Khan Foundation (Switzerland), in collaboration with local institutions such as the National Museums of Kenya and the Elsamere Conservation Centre, have been instrumental in the revival of raptor research activities in Kenya. It is imperative that these partnerships continue to grow and flourish. The concept of establishing an autonomous raptor group to coordinate raptor activities in Kenya has been discussed by various partners. In May 1998, the structure of a Kenya Raptor Working Group (KRWG) was officially approved by members of the Bird Committee of the East African Natural History Society (EANHS). The KRWG will serve as the 'raptor arm' of the EANHS, one of the oldest natural history societies in Africa (founded 1909) with a firm commitment to promoting the study of natural history and conservation of biodiversity in the East African region. The objectives of the KRWG will be

- 1) to coordinate and facilitate conservation-based ecological studies on predatory birds,
- 2) to understand factors that influence their distribution and abundance,
- 3) to continue and expand ecological monitoring programmes on existing raptor projects,
- 4) to initiate a countrywide raptor monitoring programme through a series of annual road counts and intensive banding programme,
- 5) to build and maintain a database for all ecological and conservation work related to predatory birds,
- 6) to develop and implement a community-based raptor conservation project in the Lake Naivasha region,
- 7) to conduct annual certificate courses on 'Raptor Biology and Conservation', targeted mainly towards undergraduate and graduate students as well as other institutions such as tour guide associations, park rangers and amateur naturalists,
- 8) to train individuals in aspects of identification, handling and banding of raptors,
- 9) to distribute through the EANHS, a newsletter on the latest developments and news regarding aspects of raptor biology and conservation,
- 10) to develop a detailed atlas on the distribution and status of raptors in Kenya (and East Africa),
- 11) to maintain and

foster close links with other environmental NGO's and research organizations on conservation and management issues, and also to identify and implement new projects with existing research organizations such as the International Centre for Insect Physiology and Ecology (ICIPE) and the International Centre for Research on Agro-forestry (ICRAF) in new sites such as the Ngurumans (projects under discussion include 'Understanding the impacts of Tse-tse control on raptor communities' (ICIPE) and 'The value of re-afforestation projects and their impacts on nesting raptors' (ICRAF)), 12) to work closely with the Wildlife Clubs of Kenya and arrange visits to school wildlife clubs in key raptor conservation areas, and give talks and education materials concerning the conservation of raptors (and birds in general), 13) to facilitate raptor research opportunities for visiting students/volunteers by identifying small projects and providing guidance and logistical support where possible, and 14) to work in collaboration with other world-wide raptor organisations such as the Raptor Conservation Group of the Endangered Wildlife Trust (South Africa), International Birdwatching Centre (Israel), Raptor Research Foundation (USA), among others. These collaborations are vital for project funding, further training of scientific and technical staff, for example on aspects of captive breeding, and the initiation of new raptor projects such as the use of satellite-transmitters on the little known Ruppell's Griffon Vulture *Gyps rueppellii*.

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