

Current status of diurnal breeding raptors in the greater Athi-Kaputiei Ecosystem, southern Kenya: an assessment of abundance, distribution and key areas in need of conservation

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Summary

I document the current abundance and distribution of breeding and resident raptors in the greater Athi-Kaputiei Ecosystem of southern Kenya. Data were drawn primarily from field surveys and supplemented with secondary data from other observers' records, and open-source databases. A total of 138 nests were recorded, of which 103 belonged to globally threatened and near threatened species. A total of 135 resident pairs of raptors were recorded in the area, belonging to 20 species. An additional 26 non-resident raptor species were observed in the area with varying levels of frequency. Results indicate key areas that need to be prioritized for conservation as major development projects – including a standard gauge railway, wind energy facilities, and an expressway – are implemented in the wildlife-rich Athi-Kaputiei area.

Keywords raptors, Athi Plains, Nairobi National Park, sustainable development, human-wildlife co-existence

Introduction

Kenya is currently undergoing rapid industrialization as part of the country's Vision 2030 development agenda. Despite southern Kenya supporting populations of several threatened raptors (Sorley & Andersen 1994), there is a deficiency of data on the current status of these species in key areas. Key areas are mainly those supporting breeding pairs of threatened or near threatened raptors, as well as those that support prey populations, and hence serve as important feeding areas.

Sergio *et al.* (2008) suggest that studying the entire top predator assemblage (e.g., the raptor guild) of an area, rather than just a single species, can give a reliable indication of its prey species richness and overall biodiversity because of the low species-redundancy of predator communities. This, by extension, can help indicate an area's conservation value. In addition, focusing on resident raptors can be more important than assessing all raptor species as some occurrence records may be based on one-off observations of individuals that were just passing through an area and do not necessarily indicate high quality habitat (Thomsett 2015).

This study focused on the raptor guild of the Athi-Kaputiei Ecosystem, a 2450 km² area of savanna south of Nairobi that supports a diverse wildlife community, but that is currently developing and changing very rapidly, with negative impacts on wildlife

populations (Gichohi 1996, Ogutu *et al.* 2013, Ogutu *et al.* 2014, Said *et al.* 2016). Large-scale developments currently in progress include wind energy facilities, a Standard Gauge Railway, cement factories, and a major expressway. I document the abundance and distribution of resident raptors to identify key areas where conservation efforts should be focused as development progresses.

Methods

Study area

The Athi-Kaputiei Ecosystem, or Athi Plains, comprises a gently rolling savanna landscape (measuring approximately 2450 km²) bounded by Nairobi to the north, the eastern wall of the Rift Valley to the west, a series of hills (Lukenya, Maua, and Mwambi) in Machakos to the east, and the rugged broken landscape of the Olkejuado Valley to the south (Fig. 1). The altitude gradually drops from *c.* 2000 m near Corner Baridi in the west/northwest to about 1600 m at Emarti in the southeast. The area's wildlife populations are linked to those of the southern Rift Valley and Amboseli regions and sizeable populations of large ungulates still occur in some places, as well as large carnivores including lion *Panthera leo*, leopard *Panthera pardus*, cheetah *Acinonyx jubatus*, spotted hyena *Crocuta crocuta*, striped hyena *Hyaena hyaena*, aardwolf *Proteles cristata* and African wild dog *Canis pictus* (S. Shema, unpub. data). Wildlife movements, however, have become heavily restricted due to land sub-division and infrastructure development in recent years (Ogutu *et al.* 2013).

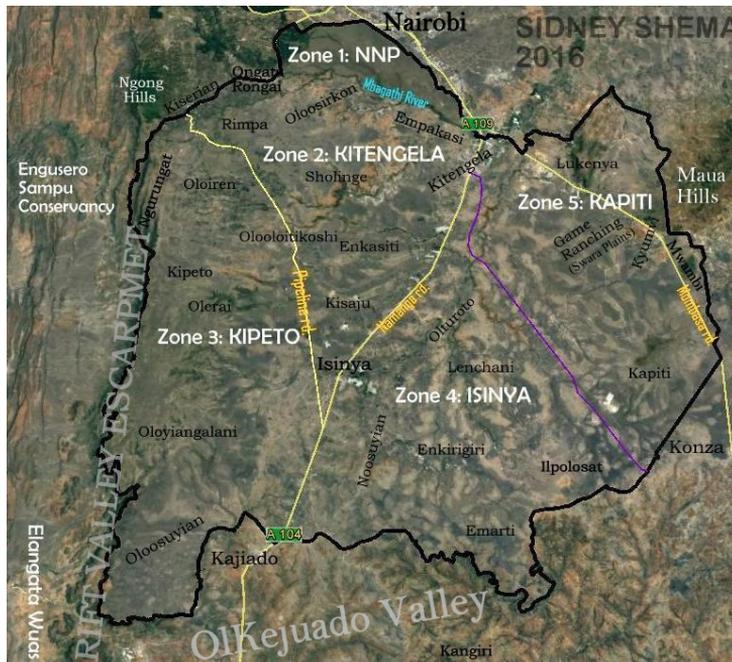


Figure 1. The study area divided into five zones. The Mbagathi River separates zones 1 and 2; the Namanga and Pipeline roads separate zones 2, 3 and 4; and the old railway (purple line) separates zones 4 and 5.

The vegetation is generally open wooded savanna, ranging from shrubby plains to open grassland with scattered trees. The density and height of the woody vegetation varies greatly depending on soil type, altitude, precipitation, and slope. Thin strips of riparian woodland dominated by *Acacia kirkii* and *A. xanthophloea* occur along several rivers and drainage lines. There is a small patch of Afromontane evergreen forest in the northwestern corner of Nairobi National Park (NNP).

Towns and settlements are associated with the major roads (Mombasa, Namanga, and Pipeline roads). Beyond 4–7km away from the main roads, the land generally opens up and the density of human infrastructure reduces substantially. This is where most of the remaining wildlife occurs (S. Shema, unpub. data). For ease of analysis, all areas with some degree of active wildlife protection, i.e. anti-poaching patrols, have been classified as ‘protected areas’. These are NNP, private ranches and properties in Zone 5 (Game Ranching, Machakos Ranching, Kapiti Plains Estate, Lisa Ranch, New Astra Ranch, Mwambi Ranch, Lukenya Hill and Maanzoni), three conservancies (Olerai, Naretunoi and Rimpa), and the Silole Sanctuary bordering the park (Fig. 2).

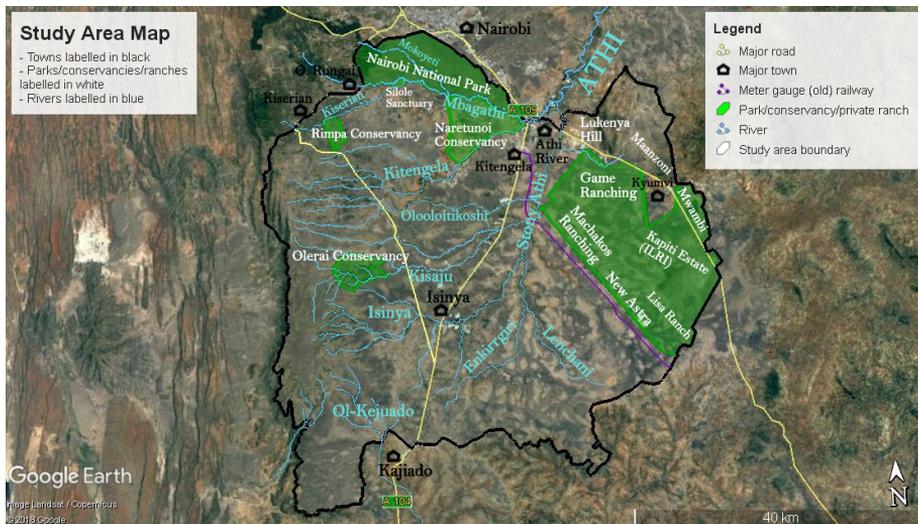


Figure 2. Map showing major towns, drainage lines and protected areas. Lukenya Hill and Maanzoni were also considered protected areas, but their boundaries were not clearly established during preliminary studies, so they were not delineated on the map.

Field surveys

Survey areas were selected based on habitat type, landscape structure, and human presence during preliminary surveys conducted throughout the entire study area in June–October 2016. Areas selected were those judged to offer potentially suitable nesting sites, mainly stands of tall mature trees along riparian zones, large hills and deep valleys/gorges, and having a low density of human infrastructure. Resident raptors were defined as those that breed and/or hold territory within the study area. Nest searches (Bibby *et al.* 2000) were conducted in the selected areas between November 2017 and September 2018. Specific areas surveyed were:

- Zone 1: NNP (NNP) mainly the western, southern and southeastern areas.

- Zone 2: Oloolotikoshi and Kitengela rivers (upper sections). Logistical challenges prevented a survey of the Kiserian Gorge, which may have a few good sites for cliff-nesting falcons.
- Zone 3: Upper sections of the Kisaju River, including Olerai Conservancy, as well as the Isinya, Olkejuado, Oloyiankalani and Ildamat rivers.
- Zone 4: Enkirrigiri, Ilpolosat, Emarti and part of the Lenchani River.
- Zone 5: Game Ranching (Swara Plains), Kapiti Plains Estate, Lisa Ranch, Machakos Ranching, New Astra Ranch, Lukenya Hill, Mwambi Ranch.

Surveys were done on foot along rivers and drainage lines (outside of NNP) and by vehicle along roads both inside and outside NNP. Motorbikes were sometimes used to access areas with poor road networks. Movement was slow during vehicle surveys with an average speed of 7.8 km/h to maximize the chances of detecting raptors (Murn & Holloway 2016). Surveys typically began in the early morning (07:00–08:00) and lasted 3–8 h depending on the size of the area. Twenty-nine surveys were conducted over the 11-month period, covering a total distance of 745.8 km, which comprised sub-surveys of 85.8 km, 73.9 km, 124.4 km, 116 km, and 345.7 km for zones 1, 2, 3, 4 and 5 respectively. No areas were surveyed twice to avoid double-counting of resident pairs.

Observations were made using binoculars and a spotting scope. Photographs were taken where possible to help with the identification of difficult species. Only pairs observed at a nest or displaying breeding, nuptial, or territorial behaviour were counted, as only these can be positively ascertained to be breeding pairs. Nestlings and incubating individuals were also considered evidence of a breeding pair. Any unoccupied and unidentified nests were recorded as 'unidentified'. Individuals that did not present clear evidence of being a resident breeding pair were not included, but were recorded as occurrence data for the species. All nests were recorded according to species and GPS coordinates were taken. Coordinates (as well as data on driving speed and distance travelled) were collected using the Geo Tracker mobile app, while details of raptor observations were recorded using the Global Raptor Impact Network (GRIN) app. Results are presented in terms of the number of nests and breeding pairs recorded for each species in each zone. A map of nest locations is not included to prevent potential human interference at the sites.

Note that no surveys were done at night, as the main focus was on diurnal raptors. The results are thus biased against nocturnal raptors (owls). Occurrence records from preliminary surveys in 2016 and a few secondary records from other observers, including from Kenya Bird Map and eBird databases (only where records could be verified with photos or other information), have been included to contribute to occurrence data.

Other notable observations in the field, such as interesting behaviour or conservation threats, were also recorded. Non-raptorial birds were opportunistically recorded on the BirdLasser app to support the Kenya Bird Map project. All maps were produced using Google Earth and Picasa. Zones are referred to in capital letters to avoid confusion with localities of similar names (e.g. KITENGELA and Kitengela). Taxonomy and nomenclature follow the *Checklist of the Birds of Kenya* 4th edition (Bird Committee, EANHS 2009). All photos are by the author unless otherwise noted.

Results

I recorded 135 resident raptor pairs in the area, belonging to 20 species. Of these, four species are globally threatened: Secretarybird *Sagittarius serpentarius* Vulnerable, Martial Eagle *Polemaetus bellicosus* Vulnerable, Lappet-faced Vulture *Torgos tracheliotus* Endangered, and White-backed Vulture *Gyps africanus* Critically Endangered. Two species are considered Near Threatened: Bateleur *Terathopius ecaudatus* and Crowned Eagle *Stephanoetus coronatus*, and the remaining 14 species are of least concern. A further 26 non-resident species were recorded, from field surveys and secondary data, making a total of 46 species recorded in the area. The majority of these species (93%, n=43) were diurnal raptors, and three (7%) were owls. Three of the non-resident species recorded were threatened: Rüppell's Vulture *Gyps rueppellii* Critically Endangered, Steppe Eagle *Aquila nipalensis* Endangered, and Greater Spotted Eagle *Aquila clanga* Vulnerable. One species is considered near threatened: Pallid Harrier *Circus macrourus*. I recorded 138 nests, of which 103 (75%) belonged to Threatened or Near Threatened species (Table 1).

The majority of nests were within protected areas (84%, n=116) with 45 (32%) in NNP, 27 (20%) in Olerai Conservancy, and 44 (32%) in the KAPITI ranches. Of the 22 nests outside protected areas, 14 (64%) were in KIPETO alone, while five (23%) were in KITENGELA and three (13%) were in ISINYA. The only nest of a threatened species found outside a protected area was a Martial Eagle nest located in KIPETO.

Species accounts

Below are detailed accounts for each resident species, and a few notable non-residents based on field notes and some secondary data. A few historical records (prior to 2016) have also been incorporated in the accounts of some species to add context where relevant. Owls are not discussed because of the sensitivity of information on their locations. References to the specific locations of nests and breeding pairs are also limited, for similar reasons.

Common Kestrel *Falco tinnunculus*

The resident race *F.t. rufescens* is present, but rare, along the Rift Valley escarpment in KIPETO. One pair was observed briefly in the Oloyiangalani area, near the site of the planned wind power project, November 2017. The birds were distinguished from the numerous migrant *F.t. tinnunculus* individuals seen by a much darker and heavily marked appearance both above and below. No photograph was obtained.

Lanner Falcon *Falco biarmicus*

The most common and widespread falcon. It was seen in several locations, but only one definite pair was recorded in KITENGELA, where two adults were seen flying together with a juvenile. This species likely nests along the Rift Valley escarpment. Sightings of juveniles and hunting adults in KAPITI suggest that a pair or two are likely resident around Lukenya, Kapiti and/or Mwambi hills, but no conclusive evidence for this was found.



Figure 3. Lanner Falcon *Falco biarmicus* adult (left) and juvenile (right). KITENGELA, 5 September 2018.

Peregrine Falcon *Falco peregrinus*

Much rarer than the Lanner Falcon, a few records from KIPETO and NNP. One resident pair of the African race (*F.p. minor*) is resident along the upper Isinya River, KIPETO. This species likely nests along the Rift Valley escarpment.

Secretarybird *Sagittarius serpentarius*

Widespread, although rare in the hilly uplands near the escarpment. All nests were on the plains, not along drainage lines, and well-hidden in the canopy of thick *Balanites* trees. Three nests were recorded. A nest on Game Ranching was active in June 2016, when found during preliminary surveys, but it was inactive when checked in April 2018. Two nests were found in NNP in 2018. One was active with an adult incubating (5 May), while the other had a pair seemingly still building (12 Aug).



Figure 5. Secretarybirds *Sagittarius serpentarius* on nests in NNP, 5 May 2018–left, and 12 Aug 2018–right.

Bat Hawk *Macheiramphus alcinus*

An unmistakable immature was seen flying into Hyrax Valley in NNP on September 2017. An adult was seen, also in flight, in a deep rocky gorge along the Kisaju River in Olerai Conservancy, KIPETO, November 2017. No pairs were observed, but the two sightings suggest that there are possible resident pairs in or near KIPETO and NNP. The crepuscular habits of this species make it hard to find.

Black Kite *Milvus migrans*

Resident *M.m. parasitus* (Yellow-billed Kite) was common in all the major towns. No attempt was made to count the number of pairs in towns. It was uncommon away from towns and settlements. One nesting pair was recorded near Olerai, KIPETO, November 2017.

African Fish Eagle *Haliaeetus vocifer*

It was most common in NNP but was also recorded outside the park at large dams in KAPITI and ISINYA. There was one record from Naretunoi Conservancy, KITENGELA. Two pairs are in NNP, one in the north at Nagolomon and Hyena dams, and the other in the south at the Athi Basin dam. It is unclear whether individuals seen along the Mbagathi River inside the park are of the pair from Athi dam. One pair is resident at Game Ranching, KAPITI. Surprisingly, no nests of this species were recorded, despite first year juveniles being seen in NNP.

Palm-nut Vulture *Gypohierax angolensis*

A vagrant to NNP. One immature was seen on 2 and 14 July 2017. These were the third and fourth ever records of this species in NNP. Two other previous records within the last five years or so (dates unspecified) were also of young dispersing birds (B. Finch, pers. comm).



Figure 6. Immature Palm-nut Vulture *Gypohierax angolensis* in NNP, 2 July 2017 (photo: Vishv Patel).

White-backed Vulture *Gyps africanus*

The Athi-Kaputiei area is undoubtedly an important breeding site for this critically endangered species. A total of 93 nests has been recorded, distributed across three nesting colonies: one in NNP with 37 nests, one in KAPITI with 35 nests and a third sizable colony in Olerai Conservancy with 21 nests. The Olerai colony (called the Karibu Colony by some) is within 10 km of a proposed wind energy project and is therefore likely to be at high risk due to collision with turbines and/or power lines once the facility is operational. Non-breeding birds may roost far from these colonies. Large roosts have been recorded in KITENGELA and KIPETO. Old abandoned nests along the Ol-Kejuado and Oloyiangalani rivers show that this species previously had a few other nest sites in KIPETO until very recently. Human disturbance and cutting of large trees seems to have driven them from these breeding sites. Illegal logging has been documented at Olerai and is a continued threat to the breeding colony. Potential natural gas exploration at Olerai is also a threat. Retaliatory poisoning of large carnivores has not been reported often within the study area, but livestock depredation, mainly by spotted hyena and leopard, but also by lion, cheetah and African wild dog is a frequent occurrence in all zones except NNP (S. Shema, unpub. data). The potential to resort to poisoning is therefore always present and is a threat to scavenging raptors, especially White-backed Vultures. It would therefore make sense for livestock protection measures to be included in a conservation strategy for this species. Compared to other large raptors, this species is quite tolerant of human activity near its nesting sites.



Figure 7. A pair of White-backed Vultures *Gyps africanus* at their nest in KAPITI, 11 September 2018.

Rüppell's Vulture *Gyps rueppellii*

This Critically Endangered cliff-nesting vulture does not breed in the Athi-Kaputiei area, but it is present year-round as a foraging visitor. Soaring birds are not an uncommon sight across the plains, but perched birds are most often seen in southern KIPETO, KAPITI and NNP. Individuals and small groups are often in close association with White-backed Vultures at carcasses, roosts and waterholes used for bathing. It is never as numerous as the preceding species, but birds sometimes congregate in sizeable numbers at large carcasses. Most individuals are likely to have come from the nearby breeding colony at Kwenia in the Rift Valley, but birds from other parts of Kenya (e.g., Hell's Gate) almost certainly also visit the area in their extensive search for feeding opportunities. The Athi Plains are undoubtedly an important foraging area for this species.

Lappet-faced Vulture *Torgos tracheliotus*

There is one active nest in NNP. Several pairs previously bred on the KAPITI ranches (S. Thomsett, pers. comm.), but all are now extirpated. This species seems much less tolerant of people than the *Gyps* vultures and it has very rarely been seen outside of NNP over the past decade.



Figure 8. A juvenile Lappet-faced Vulture *Torgos tracheliotus* in the nest in NNP, 2 October 2018 (photo: M. Pruiksma).

Black-chested Snake Eagle *Circaetus pectoralis*

A widespread and common species. Three pairs were recorded in KIPETO, two in Olerai Conservancy and one along the Isinya River, although nests have yet to be located. One unidentified nest along the Isinya River probably belonged to the resident pair of this species.

Bateleur *Terathopius ecaudatus*

One inactive nest in NNP. Only a solitary male is known to be resident. No adult female was seen for over three years, until one was seen on 5 August 2018 by B. Finch and N. Hunter. Whether she will stay or was just a wanderer is uncertain. A male (possibly the same bird from NNP) was seen soaring over Kapiti Hill on 3 September 2018. There are no other records outside of NNP. Three pairs of Bateleurs were previously resident in KAPITI (S. Thomsett, pers. comm.), but have been extirpated.

Eastern Chanting Goshawk *Melierax poliopterus*

It is widespread and fairly common south of the Mbagathi River but a very rare visitor to NNP. One pair was recorded in the Ngito area of KIPETO. Numerous sightings of birds in all zones except NNP suggest the presence of several resident pairs. No nests have been observed yet.

Gabar Goshawk *Micronisus gabar*

A widespread and common species in NNP, KAPITI and KIPETO. It is uncommon in KITENGELA and ISINYA. Four pairs were recorded in KIPETO: two pairs, both nesting, were outside of Olerai Conservancy, a third pair was recorded within Olerai but no nest was found, a fourth pair was along the Isinya River (nest not found). A pair was observed mating at Rimpa Conservancy, in October 2016 and another was observed at Kapiti Hill in Sept 2018.

Lizard Buzzard *Kaupifalco monogrammicus*

One sighting in NNP, August 2017 (N. Hunter & B. Finch, pers. comm.).

Augur Buzzard *Buteo augur*

Widespread, but most commonly seen in KIPETO and NNP. Nine pairs were recorded in KIPETO. Sightings of an adult and immature at Lukenya Hill indicate a possible pair in the area.

Greater Spotted Eagle *Aquila clanga*

This species has been wintering annually in NNP since Dec 2013. All records are of a single bird, which may in fact be the same individual returning each year (Pearson and Jackson 2016) (Hunter and Finch, pers. comm). A flock of 17 unidentified migrating eagles being hassled by a resident pair of Tawny Eagles *Aquila rapax* in KIPETO in November 2017 were possibly of this species.

Tawny Eagle *Aquila rapax*

The commonest large eagle. It is widespread with at least one resident pair recorded in each zone. Nests have also been located in each zone, except for NNP where an old nest seems to have collapsed. There are three nests belonging to two pairs in Kapiti Estate (one of the nests is on an electricity pylon). There is a pair each on Machakos Ranching and Game Ranching, as well as a pair in Enkirrigiri, Oololoitikoshi, and NNP. There are eight pairs in KIPETO, making it a total of 15 pairs in the study area. Seven (32%) of the 22 raptor nests outside of protected areas belong to Tawny Eagles, more than any other single species. This species is the most tolerant eagle to human presence in the study area.

Verreaux's Eagle *Aquila verreauxii*

One nesting pair at Lukenya and one (reportedly) along the Rift Valley escarpment, KIPETO. A pair in NNP was extirpated well before 2012 (FONNAP 2012). This species is now an extremely rare visitor to NNP. One adult was photographed in the park by N. Diaz on 28 January 2017 near the Mbagathi River. Two other similar reports within a month of this sighting suggest it was the same individual.

Wahlberg's Eagle *Aquila wahlbergi*

A very rare visitor. There have been three recent records. D. Chesire and M. Adamjee recorded one each in KAPITI in February and August 2016, respectively (Kenya Bird Map 2016) and one was seen in September 2017 in NNP (N. Hunter and B. Finch, pers. comm). No records from elsewhere.

African Hawk Eagle *Aquila spilogaster*

It is fairly common in KIPETO, but scarce elsewhere. It is a fairly rare visitor to NNP. There are four pairs in KIPETO, a pair in KAPITI and a pair nesting in KITENGELA. Individuals that are sporadically seen along the Mbagathi River in NNP, including a record of a juvenile in Feb 2017 (Leitão 2017), are most likely from this KITENGELA pair, as the Mbagathi is barely 14km north of their nest. This species and the Martial Eagle are persecuted as predators of young goats, sheep and chicken in some areas. A homestead within 200m of a nest reported that in 2017 and 2018 the eagles killed young goats at a rate of about one kill every two weeks for two months after the goats gave birth. There have been failed attempts to shoot the eagles with arrows. I advised the stock owners that they should build an enclosed shelter to keep young goats and sheep inside until they attain a size too large for the eagles, but the pair remains in real danger of being killed in retaliation.

Ayres's Hawk Eagle *Aquila ayresii*

There is one pair in NNP, but their nest is yet to be located. This species is absent from the rest of the study area as there is no suitable forest or dense woodland habitat.

Martial Eagle *Polemaetus bellicosus*

It is widespread, but rarely seen in KITENGELA and ISINYA. There is one nesting pair in NNP, two nesting pairs in KAPITI and two nesting pairs in KIPETO. Only one nest is outside a protected area. This nest is within the Kipeto Wind Power site



Figure 10. Juvenile Martial Eagle *Polemaetus bellicosus* in KIPETO, 23 November 2017.

and hence the pair is at high risk of collision with the turbines or power lines once they are constructed and operational. Another pair is also at high collision risk as it is within 10 km of another proposed wind power site along the escarpment. Anecdotal accounts from several local residents suggest that persecution as a livestock predator is a potentially significant limiting factor in the abundance and distribution of nesting pairs outside of protected areas. Some areas of ISINYA, for instance, seem ideal for Martial Eagles, but the species is absent. A field collaborator reported that an adult Martial

Eagle with a metallic ring was found dead under a tree in Ildamat in September 2017 and is suspected to have succumbed to poisoning. This was most likely secondary poisoning, however, as accounts from local people indicate, retaliation against this species is usually done by shooting it with arrows or spears. This bird was probably one of several individuals ringed in KAPITI in the 1990s and in 2012 (S. Thomsett and S. Kapila, pers. comm.).

Crowned Eagle *Stephanoaetus coronatus*

One pair is resident in NNP, but its breeding status is uncertain. It is absent from the rest of the study area because of lack of suitable forest habitat.

Discussion

Generally, several raptors are known to have more than one nest site within their territory or home range and can alternate between these during different seasons (Newton 1979, Leonardi 2015). In any given season, there will also be pairs whose breeding attempts fail early and thus may not be detected when their nests are visited (Newton, *op cit.*). This likely explains the surplus of nests in relation to the number of breeding pairs of White-backed Vultures, as well as the 12 unidentified nests and several pairs whose nests were never located (Table 1). Some of the unidentified nests certainly belong to some of these pairs.

Zone 3 (KIPETO) had the highest number of nests outside protected areas and is the only zone where a threatened species was recorded nesting outside a protected area. All nests in KIPETO are distributed from Olerai Conservancy southward. The area north of Olerai was observed to have fairly dense human settlement and notably degraded habitat during preliminary surveys and was considered unsuitable for most resident raptors and other wildlife. The protected areas are clearly the most important areas for the six species of threatened and near threatened raptors in the study area. No nests were found on Naretunoi and Rimpa conservancies, but the presence of wildlife, few human settlements, and anti-poaching patrols means that they are undoubtedly important feeding areas for some of the resident raptors as well as potentially important stop-over and wintering areas for migratory raptors.

Data from this study can be used as a baseline for future long-term monitoring of resident raptor populations as infrastructure development and other factors continue to influence the area's ecological structure. This, however, is unquestionably a shifted baseline, as true baseline data on the area's original raptor guild would need to have been collected several decades ago before the area began to be industrialized and urbanized.

Conclusion

The data indicate that NNP, KAPITI and southern KIPETO are the most important areas for the conservation of resident raptors in the Athi-Kaputiei Ecosystem. The threatened species, in particular, are almost entirely dependent on these three areas for nesting sites. Plans to build wind energy facilities in KIPETO (Kipeto Energy Ltd. 2012) make the long-term conservation of the Olerai White-backed Vulture colony a challenge. A planned expressway from Nairobi to Mombasa is likely to be built through some of the KAPITI ranches and this will also add to the challenges of raptor conservation in this key area. The construction of Phase 2 of the Standard Gauge Railway through NNP is nearly complete and the long-term impact of this mega-structure on the park's raptors remains to be seen. Close monitoring of raptors in all of these areas, especially once the facilities and structures are operational, will be vital in order to minimize the impacts of these developments on the area's raptors. Any plans for future developments in this area must also include conservation measures in their initial strategies and relevant wildlife experts be consulted extensively, from the planning to the implementation phases.

Protected areas in KITENGELA (Naretunoi and Rimpa) and open unprotected areas in southern ISINYA (Lenchani, Enkirrgiri, Noosuyian, Ipolosat, Emarti) have few nests, but they do support prey populations in the form of game birds, several mammals and other wildlife (S. Shema unpub. data). They undoubtedly serve as feeding areas for some of the resident raptors, including pairs nesting in the protected areas. Migratory species also use these areas. These are thus key areas that need conservation attention as the Athi-Kaputiei area develops. Working with local livestock owners on simple solutions to protect their young stock from large raptors is a necessity in areas with nesting Martial and African Hawk Eagles. Livestock protection against large mammalian carnivores to prevent retaliatory poisoning is also important, particularly for the large numbers of resident Critically Endangered White-backed Vultures.

Any conservation strategies that will be drawn for the Athi-Kaputiei area need to consider one very important factor, the conflict of interest among land owners. This is especially significant for the unprotected areas. Finding ways that allow land owners to benefit from their land while still coexisting with raptors and other wildlife, especially large predators, is perhaps the greatest and most important challenge in this area. Further research is needed on ways to address it. It is this challenge that conservation practitioners must focus on solving first if the resident raptors, especially the numerous breeding pairs of threatened species, are to continue to exist in the area over the long term.

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