African Primates 12: 1-8 (2017)

Species Density of *Galago moholi* at Loskop Dam Nature Reserve, South Africa

Ian S. Ray[1,2,3], Brandi T. Wren[2,4], and Evelyn J. Bowers[1]

[1]*Department of Anthropology, Ball State University, Muncie, IN USA;* [2]*Applied Behavioural Ecology and Ecosystem Research Unit, University of South Africa;* [3]*Department of Social Sciences, Community College of Aurora, Aurora, Colorado USA;*[4]*Department of Anthropology, Purdue University, West Lafayette, IN USA*

Abstract: Galagos are a poorly studied group of nocturnal primates endemic to sub-Saharan Africa, particularly in regard to distribution in southern Africa. We conducted a population survey of *Galago moholi* along the road system of Loskop Dam Nature Reserve in Mpumalanga, South Africa, during the winter months of June and July, 2011. Results from 151 km of transects that were driven over 23 survey hours indicate that the population density of *G. moholi* is several times lower than previously reported in similar areas. We estimate the population density at Loskop Dam to be between 1.4 and 5.1 animals/km^2, suggesting a population estimate for the entire reserve of 296-1029 animals. This number is substantially lower than the expected density of 95 animals/km^2 and total population of 20,000 animals based on previously published density estimates. Low population density may be due to an unknown environmental condition that, in addition, excludes other *Galago* species from the reserve.

Key words: *Galago*, **population density, strepsirrhine, bushbaby**

INTRODUCTION

Bushbabies, or galagos, are small nocturnal primates endemic to sub-Saharan Africa. Many species of galago inhabit overlapping geographical ranges, though most have differing habitat preferences when found sympatrically (Nash *et al.* 1989; Pozzi 2016). The only member of the genus *Galago* endemic to this study's research site in Mpumalanga, South Africa, is the southern lesser bushbaby (*Galago moholi* A. Smith 1836). Based on current published distribution data (Bearder *et al.* 2008), the thick-tailed bushbaby (*Otolemur crassicaudatus* É. Geoffroy Saint-Hilaire 1812) is not found within this study's locality, although greater galagos have been observed nearby. There is a significant lack of published field studies on galago behavior and ecology, particularly recent studies. This makes it difficult to establish a baseline understanding of galago ecology and distribution in southern Africa.

Galago moholi averages 158 g and 438 mm in total length, with a 288 mm tail and a 150 mm head and body (Nash *et al.* 1989). Previous reports have listed primary food sources of *G. moholi* to consist exclusively of tree gums and small arthropods (Bearder & Martin 1980; Harcourt 1986), though recent findings have noted the inclusion of plant parts in the diet (Scheun *et al.* 2014; Ray *et al.* 2016). No observations of heterothermy during the winter months of June and July, when insects are scarce, have been recorded in natural settings (Mzilikazi *et al.* 2006; Nowack *et al.* 2010, 2013).

Bearder & Doyle (1974) reported population densities of *G. moholi* that ranged from a low of 95 animals/km^2 in escarpment riparian bush and scrub habitat to a high of 500 animals/km^2 in *Vachellia karoo* (previously *Acacia karoo*) thickets. That research, however, commenced in 1968 and is now approaching 50 years old. It is likely that those

Correspondence to: Ian S. Ray, Department of Social Sciencs, Community College of Aurora, 16000 East CentreTech Parkway, Aurora, Colorado 80011 USA; Email: iray@regis.edu.

numbers are no longer representative due to human encroachment, habitat changes, anthropogenic climate change, and changes in land-use patterns across southern Africa (Hoffman & Ashwell 2001; Thomas *et al.* 2004; McCusker & Carr 2006). Further, those estimates vary greatly from 95-500 animals/km^2 and later studies using radio tracking found significantly lower densities of 31 animals/km^2 (Bearder 1987).

The goal of this study was to survey the population of *G. moholi* at Loskop Dam Nature Reserve in South Africa to assess its abundance and distribution. Specifically, our objectives were to: 1) record sightings of *G. moholi*; and 2) calculate an estimated population density of *G. moholi* at the study site.

MATERIALS AND METHODS

Research Site

This project was conducted between June and July, 2011 at Loskop Dam Nature Reserve (LDNR). LDNR is located in northern Mpumalanga province, South Africa, with a portion of the reserve extending into Limpopo province (25°259' S, 29°189' E). The reserve measures 22,000 ha in size including the reservoir created by Loskop Dam (Ferrar & Lotter 2007). Daily temperatures within the reserve ranged from 7°C to 21°C during the study period, and from 7°C to 29°C during 2011 (National Center for Environmental Information 2016). Monthly precipitation in 2011 ranged from 0 cm (July) to 19 cm (January), with no rainfall occurring during the study period. The reserve is managed by the Mpumalanga Tourism and Parks Agency, and the University of South Africa's Applied Behavioural Ecology and Ecosystem Research Unit maintains a research camp within its boundaries. To our knowledge, no other research has been conducted on galagos in LDNR.

Survey Methods

Transects were driven throughout LDNR's tourist road system between the hours of 1800 and 2200 on 12 nights between June 29 and July 12, 2011 (winter at the study site). We surveyed a total of 151 km over 23 hours. Transects were driven, not walked, due to safety concerns expressed by reserve management owing to the presence of predators (e.g., leopard) and large dangerous game (e.g., rhinoceros and buffalo). Transects were selected based on major road landmarks and driven for approximately three hours per night (Figure 1). Fifteen minute breaks

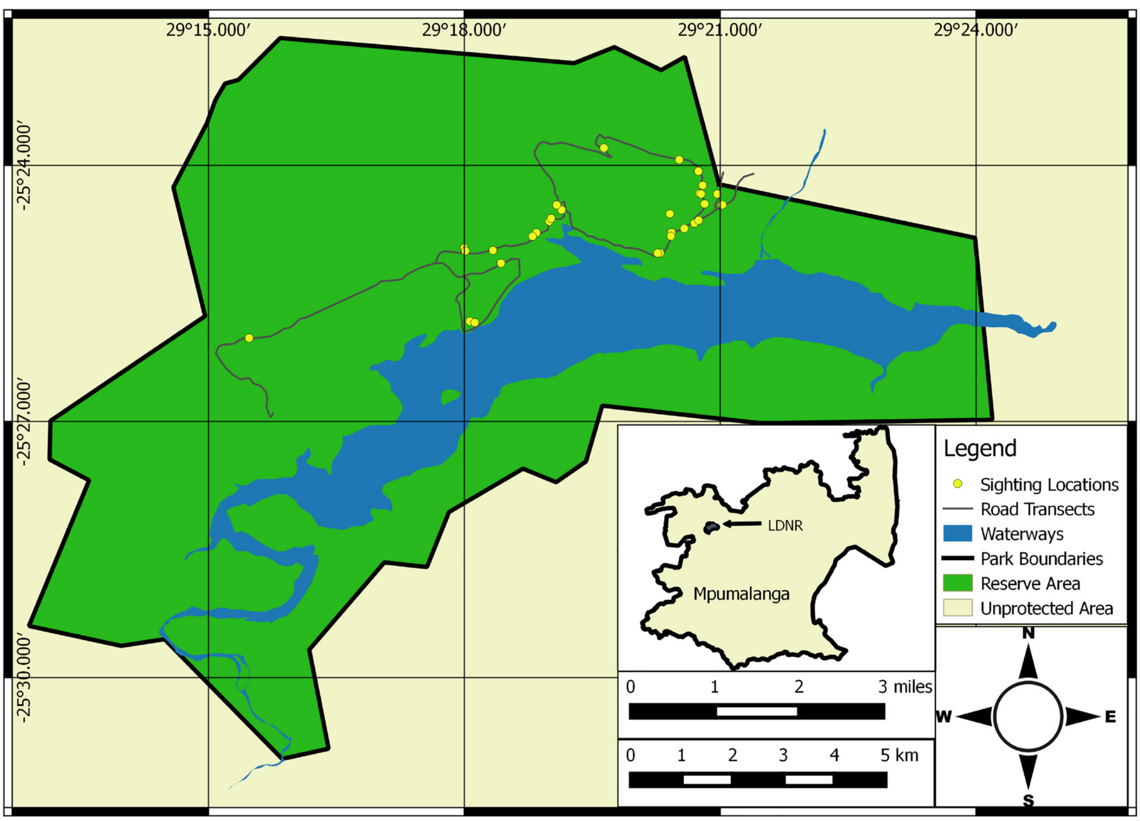

Figure 1. Map of driven transects and sightings in Loskop Dam Nature Reserve, Mpumalanga, South Africa

were taken after each transect to avoid observer fatigue. Transects were between 2.4 km and 7.5 km. All roads were driven at the beginning, middle, and end of a night and in each direction, resulting in a total of six separate surveys of each transect. Surveys were scheduled to ensure each segment had not been driven for at least two hours before collecting data.

The following habitat types are present within the survey area of this study: *Senegalia caffra–Setaria sphacelata* var. *sphacelata* woodland, *Vachellia karoo–Dichrostachys cinerea* shrubland, *Vachellia nilotica–Senegalia caffra* woodland, *Heteropogon contortus–Sclerocarya birrea* woodland, *Hyperthelia dissoluta* grassland, *Lippia javanica–Loudetia simplex* shrubland, and *Olea europea* subsp. *africana–Rhus leptodictya* woodland (Barrett *et al.* 2010). Although a comprehensive vegetation survey of LDNR has not been conducted, these habitat types appear to be representative of the areas of the reserve that were surveyed in this study (Barrett *et al.* 2010; Filmalter 2010; Nkosi *et al.* 2016).

A Nissan pick-up truck with an open bed (i.e., bakkie) was used for surveys. One member of the research team was chosen as the driver and two team members knelt in the bed of the truck behind the cab. This provided 360° visibility for the observers above the cab of the truck. Speed varied from 4-13 km per hour with a target speed of 10 km per hour, consistent with the methodologies of other vehicle surveys (Nekaris & Jayewardene 2004; Off *et al.* 2008; Leca *et al.* 2013; Acharya *et al.* 2015). *Galago moholi* were spotted by the distinctive red tapetal reflections using 600 lumen LED torches with an illumination distance of 412 m. We recorded measurements for each of the following variables for every sighting: distance to the individual using a laser rangefinder, a compass bearing to the individual from the transect, and GPS coordinates of the vehicle.

Analysis

Transect data were analyzed using six methods presented by the (National Research Council Subcommittee on Conservation of Natural Populations 1981). These were maximum perpendicular distance, maximum reliable perpendicular distance at 15 m and 30 m, maximum observer-to-animal distance, maximum reliable observer-to-animal distance at 30 m and 50 m, mean perpendicular distance, and mean observer-to-animal distance. Maximum perpendicular distance analysis used the greatest perpendicular distance at which a subject was spotted to determine the area analyzed from the area sampled. Maximum reliable perpendicular distance truncates these data by selecting cutoff distances, as it was unlikely that all individuals were sighted beyond this distance. Maximum reliable perpendicular distance was determined by: 1) constructing a histogram of all perpendicular distances at which a subject was sighted (Figure 2) and, 2) selecting any low points in sighting frequency as cutoffs. In this study, these low points occurred at 15 m and 30 m. Maximum observer-to-animal distance assumes that all individuals within the distance to the farthest sighting were observed. Maximum reliable observer-to-animal distance was determined by constructing a histogram of all observer-to-animal distances and selecting any low points in sighting frequency as cutoffs. In this study, these low points occurred at 30 m and 50 m.

For all analytical methods, perpendicular distance was calculated using the degrees off transect of the farthest sighting with the formula (sighting distance) $\sin\theta$. Observer-to-animal distance was determined using a laser rangefinder, and thus needed no mathematical adjustment. We used Excel for all statistical analyses.

RESULTS

We recorded a total of 29 individual encounters of *G. moholi* (Appendix 1). Observer to animal distance ranged from 5 m to 95 m. Calculated perpendicular distances ranged from 0 m to 65 m. The various methods used yielded a range of estimates from 0.96 ± 0.02 animals/km^2 to 5.02 ± 0.11 animals/km^2 (Table 1). Due to the low number of sightings, it was possible to determine only a maximum reliable sighting distance for the entire survey area and not for each individual transect. The mean perpendicular distance method resulted in the highest density estimate of 5.02 animals/km^2, while the mean observer to animal distance method resulted in a more conservative estimate of 2.97 animals/km^2. The maximum perpendicular distance method yielded a density estimate of 1.58 animals/km^2, while the maximum observer to animal distance method yielded a density estimate of 0.96 animals/km^2. Standard deviations were calculated based purely on statistical error and not systematic error.

With a cut-off of 15 m, the maximum reliable perpendicular distance method yielded an estimate of 3.77 animals/km^2, or 773 animals throughout the reserve. If a 30 m cut-off is used, that estimate drops to 2.51 animals/km^2 or 515 animals throughout the reserve. These estimates differ from the similar maximum reliable observer-to-animal distance

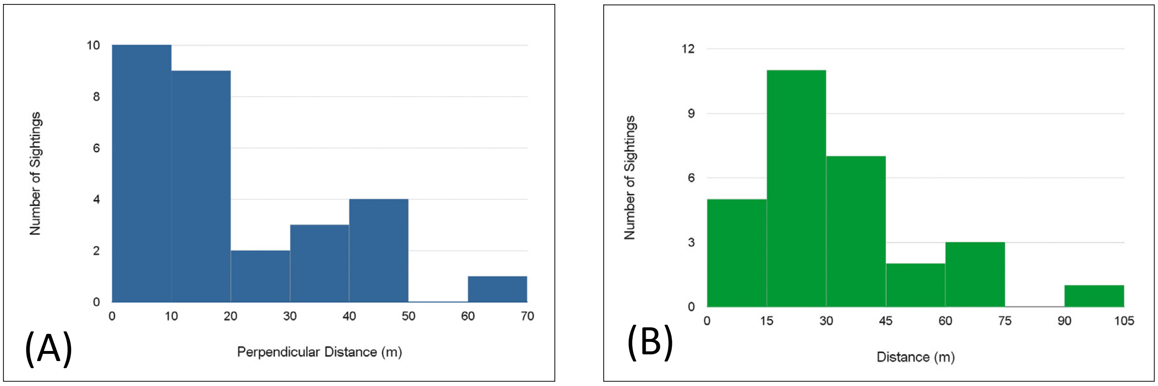

Figure 2. Histogram of sighting distance to Galago moholi individuals at Loskop Dam Nature Reserve as: (A) calculated perpendicular sighting distance, and (B) linear distances from observers.

method. For this method, a cut-off of 30 m yields an estimated population density of 1.78 animals/km^2 or 365 animals throughout the reserve. If a cut-off of 50 m is used, the estimate drops to 1.45 animals/km^2 or 296 animals throughout the reserve.

DISCUSSION

The National Research Council of the United States determined that the most reliable protocols for determining population density are the maximum reliable perpendicular distance method and the maximum reliable observer-to-animal distance method (National Research Council Subcommittee on Conservation of Natural Populations 1981). Regardless of the method used, the estimated density of *G. moholi* at LDNR is lower than the estimate of 95 animals/km^2 reported by Bearder & Doyle (1974) (Table 2). Cold temperatures, a higher latitude, higher altitude, and decreased activity of *G. moholi* during winter months may have resulted in underestimates of the population. Because no study to date has noted such extreme differences in population structure between seasons (Bearder & Doyle 1974; Harcourt 1980), and because this study occurred during mating season, it is not likely that the season alone accounts for the substantial difference in population estimates. The galago population at LDNR could also experience more ecological stress than populations at lower latitudes and altitudes. Some stress may be a result of the dam and its effects on microhabitats within the reserve as well as documented water pollution in the dam (Oberholster *et al.* 2011; Dabrowski *et al.* 2013). It is also possible that population numbers have declined since the previous studies were conducted nearly fifty years ago. More studies at a greater number of sites are imperative for understanding galago population distribution and ecology.

Nash & Whitten (1989) discuss density estimates of the similar *Galago senegalensis* in Kenya (Table 2). Analytical methods used in their study were similar to the present study, though data were collected on foot rather than from a driven vehicle (Nash & Whitten 1989). The population density estimate for the area was found to be 1.5 animals/ha, or approximately 150 animals/km^2 (Nash & Whitten 1989). This estimate, while still lower than Bearder & Doyle's (1974) estimates, is substantially greater than the estimated population density of LDNR.

Off *et al.* (2008) also reported population densities of *G. senegalensis* in another area of Kenya, and used the same methods as the present study (Table 2). Their analysis resulted in estimates similar to those found by Nash & Whitten (1989). *Galago senegalensis* was found to have a population density of between 40 and 240 animals/km^2, with variation largely due to differences in dry bush and riverine habitats (Off *et al.* 2008). The area surveyed at LDNR contained similar proportions of each habitat and included a larger overall area of sampling (Table 2). Individuals were most frequently spotted in riverine areas or trees adjacent to known waterways, though the low population density prevented any statistical analysis of this observation.

Vehicular surveys have been used with a wide variety of taxa and terrain, including *Myrmecophaga tridactyla* in Brazil (de Miranda *et al.* 2006); *Loris tardigradus* in Sri Lanka (Nekaris & Jayewardene 2004); *Sus scroffa, Capreolus capreolus,* and *Vulpes vulpes* in Belgium (Morrelle *et al.* 2012); *Trachypithecus auratus* in Indonesia (Leca *et al.* 2013); and *Macaca mulatta* in urban India (Acharya *et al.* 2015). There is debate over the utility of

Table 1. Estimated Species Density of *G. moholi* Using Multiple Analytical Techniques.

Analytical Method	Estimated Density (animals/km²)	Estimated Population in Reserve (animals)
Maximum Perpendicular Distance	1.58 ± 0.03	324 ± 7
Maximum Reliable Perpendicular Distance (15m)	3.77 ± 0.14	773 ± 30
Maximum Reliable Perpendicular Distance (30m)	2.51 ± 0.07	515 ± 15
Maximum Observer to Animal Distance	0.96 ± 0.02	197 ± 5
Maximum Reliable Observer to Animal Distance (30m)	1.78 ± 0.07	365 ± 15
Maximum Reliable Observer to Animal Distance (50m)	1.45 ± 0.04	296 ± 9
Mean Perpendicular Distance	5.02 ± 0.11	1029 ± 23
Mean Observer to Animal Distance	2.97 ± 0.06	609 ± 13

population surveys conducted on foot and those conducted from a vehicle. We believe that, because similar results were obtained by Nash & Whitten (1989) and Off *et al.* (2008), both methods are comparable with regard to galago research.

Recent fieldwork on strepsirrhines in southern Africa has revealed that our understanding of galago distribution and ecology still contains many gaps (Génin *et al.* 2016). One major development is the recent discovery of *Galagoides granti* (the Mozambique lesser bushbaby) populations within South Africa (Génin *et al.* 2016). The species was previously believed not to be present near the South African border, let alone within South Africa, which means that the published distributions of *G. moholi* and *O. crassicaudatus* in southern Africa need to be revised.

We have noted the marked absence of *O. crassicaudatus* from many areas of its range (Ray *et al.* unpublished data). In particular, *O. crassicaudatus* was not observed in the area of the Tuli Block of Botswana during preliminary field excursions for future projects. Because the habitat at LDNR is similar to other nearby areas where *O. crassicaudatus* is known to exist, it is unclear why that species has not been found at this study site as well (Bearder 2008). Regardless, the lack of *O. crassicaudatus* at LDNR suggests that the low population sizes of *G. moholi* are not due to competition from larger-bodied strepsirrhines, or that *G. moholi* out-competes *O. crassicaudatus*.

CONCLUSIONS

The density of *G. moholi* at Loskop Dam Nature Reserve, at an estimated 2.5-3.8 animals/km², is particularly low compared both to the density observed at other sites in southern Africa and to other *Galago* species in Africa (Bearder & Doyle 1974; Nash & Whitten 1989; Off *et al.* 2008). These findings highlight the lack of knowledge on the ecology and distribution of galagids, especially those within southern Africa. Further, recent work on *G. moholi* suggests that we have a great deal to learn still about galago dietary ecology (Scheun *et al.* 2014; Ray *et al.* 2016). This study contributes to that gap in knowledge by providing current data on galago population size and distribution in southern Africa.

ACKNOWLEDGEMENTS

We would like to thank Ruby Malzoni and Michele Mignini for their assistance in conducting the population survey. We are also grateful for the aid provided by Jannie Coetzee and the staff of the Applied Behavioural Ecology and Ecosystem Research Unit (ABEERU) of the University of South Africa (UNISA), and for being allowed to work at Loskop Dam Nature Reserve.

LITERATURE CITED

Acharya, P., A. Sadar & S. Ray. 2015. Determining the interrelationship between macaque population and land cover/use type in Delhi, using line transect method. *Biological Forum* 7(2): 903-943.

Barrett, A., L.R. Brown, L. Brown & P. Henzi. 2010. A floristic description and utilisation of two home ranges by vervet monkeys in Loskop Dam Nature Reserve, South Africa. *Koedoe* 52(1). DOI: 10.4102/koedoe.v52i1.990.

Bearder, S.K. & G.A. Doyle. 1974. Ecology of bushbabies *Galago senegalensis* and *Galago crassicaudatus*. In *Prosimian Biology*. R.D. Martin, G.A. Doyle & A.C. Walker, eds. Duckworth

Table 2. Estimates of *Galago* Population Densities in Africa.

Species	Location(s)	Method	Population Estimate (individuals / hectare)	Area Sampled (hectares)	Number of Observations	Source
Galago senegalensis	Ewaso Nyiro River, Kenya	maximum perpendicular	0.4 - 2.4	25.2	185 individuals 152 encounters	Off *et al.* 2008
Galago senegalensis	ADC Mutara Cattle Ranch, Kenya	direct count of focal groups	1.5	3.5	n/a	Nash & Whitten 1989
Galago moholi	South Africa, Rhodesia	unreported	0.878 - 5.0	unreported	unreported	Bearder & Doyle 1974
Galago moholi	South Africa	radio telemetry	0.31	100	9000 positional records	Bearder & Martin 1979
Galago moholi	Loskop Dam Nature Reserve, South Africa	maximum perpendicular	0.01	284.3	29 individuals 28 encounters	present study

Publishers, London. Pp 109-130.

Bearder, S.K. & R.D. Martin. 1979. The social organization of a nocturnal primate revealed by radio tracking. In *A Handbook on Biotelemetry and Radio Tracking*. C.J. Amlaner & D.W. Macdonald, eds. Pergamon Press, Elmsford, NY. Pp 635-648.

Bearder, S.K. & R.D. Martin. 1980. Acacia gum and its use by bushbabies, *Galago senegalensis*. *International Journal of Primatology* 1(2): 103-128.

Bearder, S.K. 1987. Bushbabies, lorises, and tarsiers: diverse societies in solitary foragers. In *Primate Societies*. B.B. Smuts, D.L. Cheney, R.M. Seyfarth, R.W. Wrangham, and T.T. Struthsaker, eds. Chicago: University of Chicago Press. Pp. 11-24.

Bearder, S. 2008. *Otolemur crassicaudatus*. The IUCN Red List of Threatened Species 2008: e.T15643A4943752. http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T15643A4943752.en.

Bearder, S., T.M. Butynski & M. Hoffmann. 2008. *Galago moholi*. The IUCN Red List of Threatened Species 2008: e.T8788A12932349. http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T8788A12932349.en.

Dabrowski, J., P.J. Oberholster, J.M. Dabrowski, J. Le Brasseur & J. Gieskes. 2013. Chemical characteristics and limnology of Loskop Dam on the Olifants River (South Africa), in light of recent fish and crocodile mortalities. *Water SA* 39(5): 675-686. Retrieved August 01, 2016, from http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S1816-79502013000500010&lng=en&tlng=pt.

de Miranda, G.H.B., W.M. Tomás, C.B. Valladares-Páuda & F.H.G. Rodrigues. 2006. Giant anteater (*Myrmecophaga tridactyla*) population survey in Emas National Park, Brazil: a proposed monitoring program. *Endangered Species UPDATE* 23(3): 96-103.

Ferrar, T.A. & M.C. Lotter. 2007. *Mpumalanga Biodiversity Conservation Plan Handbook*. Nelspruit, Mpumalanga Parks and Tourism Agency, Nelspruit, South Africa.

Filmalter, N. 2010. A vegetation classification and management plan for the Hondekraal section of the Loskopdam Nature Reserve. Magister technologiae dissertation, University of South Africa, Johannesburg, South Africa.

Génin, F., A. Yokwana, N. Kom, S. Couette, T. Dieuleveut, S.C. Nash & J.C. Masters. 2016. A New galago species for South Africa (Primates: Strepsirhini: Galagidae). *African Zoology* 51(3): 135-143.

Harcourt, C. S. 1980. Behavioural adaptations in South African Galagos. Unpublished MsC dissertation from University of the Witwatersrand, Johannesburg, South Africa.

Harcourt, C. 1986. Seasonal variation in the diet of South African galagos. *International Journal of Primatology* 7(5): 491-506.

Hoffman, T., & A. Ashwell. 2001. *Nature Divided:*

Land Degradation in South Africa. Cape Town: University of Cape Town Press.

Leca, J., N. Gunst, A. Rompis, G. Soma, I.G.A. Arta Putra, & I. Nengah Wandia. 2013. Population density and abundance of ebony leaf monkeys (*Trachypithecus auratus*) in West Bali National Park, Indonesia. *Primate Conservation* 26: 113-144.

McCusker, B. & E.R. Carr. 2006. The co-production of livelihoods and land use change: case studies from South Africa and Ghana. *Geoforum* 37(5): 790-804.

Morelle, K., P. Bouché, F. Lehaire, V. Leeman, & P. Lejeune. 2012. Game species monitoring using road-based distance sampling in association with thermal imagers: a covariate analysis. *Animal Biodiversity and Conservation* 35(2): 253-265.

Mzilikazi, N., J.C. Masters & B.G. Lovegrove. 2006. Lack of torpor in free-ranging southern lesser galagos, *Galago moholi*. *Folia Primatologica* 77: 465-476.

Nash, L.T., S.K. Bearder & T.R. Olson. 1989. Synopsis of galago species characteristics. *International Journal of Primatology* 10(1): 57-80.

Nash, L.T. & P.L. Whitten. 1989. Preliminary observations on the role of acacia gum chemistry in acacia utilization by *Galago senegalensis* in Kenya. *American Journal of Primatology* 17(1): 27-39.

National Center for Environmental Information. 2016. Land Surface Station Oudestad. NOAA. Accessed 28 Jul 2016. Retrieved from http://www.ncdc.noaa.gov/orders/isd/9172557095940dat.txt

National Research Council Subcommittee on Conservation of Natural Populations. 1981. *Techniques for the Study of Primate Population Ecology*. National Academy Press, Washington, D.C.

Nekaris, K., & J. Jayewardene. 2004. Survey of the slender loris (Primates, Lorisidae Gray, 1821: *Loris tardigradus* Linnaeus, 1758 and *Loris lydekkerianus* Cabrera, 1908) in Sri Lanka. *Journal of Zoology* 262(4). 327-338. doi:10.1017/S0952836903004710.

Nkosi, S.E., A.S. Barrett & L.R. Brown. 2016. Vegetation ecology of the Nooitgedacht section of Loskop Dam Nature Reserve, Mpumalanga. *South African Journal of Botany* 105: 79-88.

Nowack, J., N. Mzilikazi & K.H. Dausmann. 2010. Torpor on demand: heterothermy in the non-lemur primate *Galago moholi*. *PLoS One* 5(5): e10797.

Nowack, J., M. Wippich, N. Mzilikazi & K.H. Dausmann. 2013. Surviving the cold, dry period in Africa: behavioral adjustments as an alternative to heterothermy in the African lesser bushbaby (*Galago moholi*). *International Journal of Primatology* 34: 49-64.

Oberholster, P.J., J.G. Myburgh, P.J. Ashton, J.J. Coetzee, & A.M. Botha. 2011. Bioaccumulation of aluminium and iron in the food chain of Lake Loskop, South Africa. *Ecotoxicology and Environmental Safety* doi:10.1016/j.ecoenv.2011.08.018.

Off, E.C., L.A. Isbell & T.P. Young. 2008. Population density and habitat preference of the Kenya lesser galago (*Galago senegalensis braccatus*) along the Ewaso Nyiro River, Laikipia, Kenya. *Journal of East African Natural History* 97(1): 109-116.

Pozzi, L. 2016. The role of forest expansion and contraction in species diversification among galagos (Primates: Galagidae). *Journal of Biogeography* 43: 1930-1941.

Ray, I.S., B. T. Wren & E. J. Bowers. 2016. Documentation of plant consumption by *Galago moholi*. *African Primates* 11: 45-48.

Scheun, J., N.C. Bennett, A. Ganswindt & J. Nowack. 2014. Spicing up the menu: evidence of fruit feeding in *Galago moholi*. *Primates* 55: 359-363.

Thomas, C.D., A. Cameron, R.E. Green, M. Bakkenes, L.J. Beaumont, Y.C. Collingham, B.F. Erasmus, M.F. De Siqueira, A. Grainger, L. Hannah & L. Hughes. 2004. Extinction risk from climate change. *Nature* 427(6970): 145-148.

Received: 9 April 2016
Accepted: 13 January 2017

Appendix 1. Sighting of *Galago moholi* at Loskop Dam Nature Reserve, South Africa.

Sighting Location		Distance to Animal (m)	Degrees off Transect	Perpendicular Distance (m)
S 25°25.2902'	E 29°18.0666'	43	272°	42
S 25°25.8526'	E 29°18.1345'	25	245°	1
S 25°24.6606'	E 29°19.0892'	18	338°	17
S 25°23.7967'	E 29°19.6454'	15	35°	6
S 25°24.2260'	E 29°20.7792'	43	284°	41
S 25°24.4770'	E 29°20.8126'	60	0°	0
S 25°24.4770'	E 29°20.8126'	36	7°	24
S 25°24.7977'	E 29°18.8458'	15	123°	7
S 25°25.1446'	E 29°18.4181'	5	323°	3
S 25°24.5522'	E 29°19.1752'	95	355°	0
S 25°24.6681'	E 29°20.6992'	25	75°	10
S 25°24.8473'	E 29°20.4168'	33	343°	18
S 25°25.0282'	E 29°20.3030'	13	90°	12
S 25°24.4531'	E 29°19.0862'	15	321°	8
S 25°24.6125'	E 29°19.0329'	19	338°	18
S 25°24.9950'	E 29°17.9791'	68	122°	34
S 25°24.3271'	E 29°20.7715'	19	285°	15
S 25°24.8282'	E 29°18.8129'	24	60°	7
S 25°24.9700'	E 29°18.3440'	39	310°	33
S 25°24.6516'	E 29°20.7517'	11	80°	11
S 25°24.7895'	E 29°20.4585'	44	55°	44
S 25°24.8258'	E 29°20.4275'	14	45°	12
S 25°25.0305'	E 29°20.2947'	55	65°	45
S 25°24.0658'	E 29°20.7500'	5	270°	1
S 25°24.0658'	E 29°20.7500'	18	50°	5
S 25°24.3191'	E 29°20.7726'	20	313°	18
S 25°26.0207'	E 29°15.4519'	53	10°	29
S 25°24.3478'	E 29°21.0374'	39	310°	33
S 25°23.9261’	E 29°19.0912'	68	350°	65