Research Topics at Colobus Conservation, Kenya

Colobus, Sykes, Vervets, Baboons

BSc, MSc and PhD Students

Colobus Conservation is located in Diani, Kenya, on the South East coast of Kenya. Diani is an ideal location for research due to its high density of habituated primates, amazing white sand beaches of the Indian Ocean, and its accessibility by air and by road.

The office of Colobus Conservation including the student/volunteer housing is at the southern end of Diani on a forested property with wild primates as well as caged primates that are undergoing rehabilitation and release back to the wild. Diani's primates are well habituated and students can study feeding or social behaviours within a few meters of their subjects for all species – colobus, Sykes, vervets, baboons. Because of this, little time is required to start collecting data, especially important if your time is limited.

The white sand beaches, palm trees and crystal clear water of the Indian Ocean, gives Diani a Trip Advisor rating of one of the top 25 beaches in the world and it is only a few meters away from the Colobus Conservation property. Diani also has all the facilities expected of an international beach destination including hospitals, golf course, beach bars etc. Access to Diani is a flight from Nairobi directly into Ukunda, only a 10 minute drive from Colobus Conservation.

Diani is known for its high primate biodiversity. With four monkey species, there are approximately 1,400 individuals (counted annually!) in the 7 km^2 town. Two species of galagos have been recorded as well. Diani's vegetation includes patches and remnants of the East African coastal forest ecosystem, one of the top global biodiversity hotspots.

Colobus Conservation works in partnership with local communities to address the human – primate conflicts in the area and to preserve the nationally threatened colobus monkey including the conservation of the unique coastal forest habitat on which they depend. Colobus Conservation programs focus on mitigation strategies for:

- Habitat fragmentation;
- Injuries and deaths due to vehicles;
- Injuries and deaths due to electrocutions on power lines;
- Primates kept as pets;
- Primate Management including crop raiding;
- Snaring of primates.
- Indigenous tree/rare endemics of Diani phenology

We have outlined a variety of primate projects related to these programs and that have a direct conservation benefit. You can view these at:

http://www.colobusconservation.org/index.php/conservation/research-topics

As a student, you can collect your own data or analyse the data already collected by Colobus Conservation. Alternatively, you can research your own topic.

If you would like the list emailed to you or you have any other question, please contact the Conservation Manager for further information at enquiries@colobusconservation.org.

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Thesis Topics

1. Pattern of occurrence of primate injuries and deaths due to vehicles on Diani's beach road

Degree: Masters or Doctorate

Background: Colobus Conservation has animal welfare data for the injuries and deaths of primates in Diani due to vehicles since 1997. An analysis is currently under way to identify patterns of this data in terms of species, age, sex, season and trends over time.

Research: An analysis of the ***location*** of the injuries and deaths of all primate species in Diani due to vehicles is required which takes into account: 1) location and density of primate groups in the vicinity of either side of the road as determined from the annual primate census; 2) vegetation types adjacent to the road; and 3) location of 'colobridges', aerial bridges across the road linking tree canopies. This will be a statistical analysis and will also include a considerable GIS component.

Data: The student will collect GPS locations of injuries and deaths on the roads as indicated on the animal welfare data sheets. Primate group locations, vegetation data and colobridge locations have been geo-referenced though data may need to be extrapolated for some study years.

Purpose: By understanding how the distribution of primate groups and ground cover affect risk of injuries and deaths on Diani's beach road, Colobus Conservation and conservation managers at other sites are able to development more effective mitigation strategies to this type of human-primate conflict.

Related research: Drews, C., 1995. *Road kills of animals by public traffic in Mikumi National Park, Tanzania, with notes on baboon mortality*. African Journal of Ecology. 33(2): 89-100.

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2. Monitor the effectiveness of the aerial canopy bridges as a mitigation strategy to reduce injuries and deaths of primates due to vehicles

Degree: Masters or Doctorate

Background: Colobus Conservation currently has 28 tree canopy bridges, known as colobridges, that cross Diani's tarmac road to reduce injuries and deaths of primates due to vehicles. Two colobridge use studies (2004 and 2011) have already been analysed in terms of species use of the colobridges.

Research: An analysis of the colobridge use data from the 2004 and 2011 studies is required which takes into account the location of primate groups in the vicinity of the colobridges and the surrounding vegetation types to understand the pattern of colobridge use.

Data: The data sets to be used are: 1) colobridge use data from the 2004 and 2011 studies; 2) primate locations based on the annual census of 2004 and 2011; 3) vegetation/ground cover data in the vicinity of the colobridges. This analysis will include a considerable GIS component.

Purpose: To understand the use patterns for each of the colobridges due to vegetation and primate distribution in the vicinity of bridges. This is important to understand this mitigation strategy and how best to place colobridges in Diani. The analysis is important for conservation managers globally who are considering colobridge-like structures.

Related research: Walsh, M.,T., Walsh, P.A., 2005. *Canopy Bridges along a Rainforest Pipeline in Ecuador*. OEPC, Society of Petroleum Engineers.

3. Road crossing behaviours for four primate species

Degree: Bachelors or Masters

Background: A two lane tarmac road runs the length of Diani for approximately ten kilometres. Primates cross the road to reach foraging and sleeping sites but this results in individuals getting injured or killed by vehicles.

Research: To compare and contrast how the four species of monkeys (colobus, Sykes, vervets, baboons) cross the road in Diani in terms of individual and group behaviour. Alternatively, one species can be studied in depth.

Data: Data to be collected by student. This would entail sitting on the roadside waiting for monkeys to cross the road and recording crossing behaviours (i.e. vigilance, group cohesion) by species, age and sex categories as well as noting variables such as presence and absence of forest, time of day etc. Crossings happen reasonably frequently.

Purpose: To better explain why different species of primates have different rates of injuries and deaths due to vehicles in order to further develop mitigations to reduce the incidences of these types of animal welfare cases.

Related research: Hockings, K.J., 2011. *Behavioural flexibility and division of roles in chimpanzee road-crossing.* In: Matsuzawa, T., and Sugiyama, Y. (eds), The Chimpanzees of Bossou and Nimba, Tokyo, Springer, pp. 85-96, ISBN 978-4-431-53920-9; E-ISBN 978-4-431-53921-6.

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4. The effectiveness of tree trimming around power lines as a mitigation strategy for primate electrocution

Degree: Masters or Doctorate

Background: One to two individuals are killed on power lines or transformers each month in Diani. Colobus Conservation trims trees around power lines forcing primates to come to the ground rather than use the power lines as aerial pathways between tree canopies.

Research: To analyse the effectiveness of tree trimming around power lines on the rates of injuries and deaths due to electrocutions between the different species of primates in Diani.

Data: Using the electrocution animal welfare data sheets, locate and GPS the site of each electrocution. In addition, map the tree trimming areas. The analysis will look at whether there is any change in electrocution frequency with tree trimming. This analysis will include a considerable GIS component.

Purpose: To determine if this primate electrocution mitigation strategy is effective and if so, to publicize the technique to other conservation organisations globally.

Related research: Printes, R.C., Buss, G., Jardim, M., Fialho, M., Dornelles, S., Perotto, M., Brutto, L.,F.,G., Girardi, E., Jerusalinsky, L., Liensenfeld, M.V.A., Lokschin, L.X., Romanowski, H.P. 2010. *The Urban Monkeys Program: A survey of* Alouatta clamitans *in the South of Porto Alegre and its influence on land use policy between 1997 and 2007.* Primate Conservation, (25):11-19.

5. The effectiveness of insulating power lines as a mitigation strategy for primate electrocution

Degree: Bachelors or Masters

Background: One to two individuals are killed on the power lines each month in Diani. Colobus Conservation insulates low voltage power lines to stop electrocutions of primates as they use the power lines as aerial pathways between tree canopies.

Research: To analyse the frequency of electrocution injury and death before and after insulation of power lines for the different species of primates in Diani.

Data: Using the electrocution data sheets, locate and GPS the site of each electrocution along the lines of insulation. In addition, map the insulated lines. This analysis will include a considerable GIS component.

Purpose: To determine if this mitigation to primate electrocution is effective and if so, to publicize the technique to other conservation organisations globally.

Related research: No previous research on this topic known.

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6. The effectiveness of mitigations to deter baboons from crop-raiding

Degree: Masters

Background: Colobus Conservation has investigated the crop-raiding behaviours of baboons, Sykes and vervets on farms over the past few years.

Research: A specific crop-raiding mitigation has been determined by Colobus Conservation as likely to be effective against crop-raiding in corn fields by primates.

Data: The student will take data on crop-raiding events before and after the mitigation is put in place and carry out a statistical analysis to determine the level to which the mitigation is effective.

Purpose: Crop-raiding primates are a problem around the world. We would like to determine if some simple mitigations may help farmers manage this issue in a humane manner and reduce this human-primate conflict.

Related research: Hill, C.M. and Wallace, G.E., 2012. *Crop protection and conflict mitigation: reducing the costs of living alongside non-human primates*. Biodiversity Conservation. 21:2569–2587.

7. Monitor the effectiveness of primate issue management mitigation strategies in hotels

Degree: Bachelors or Masters

Background: Colobus Conservation works with hotels within Diani to reduce problems associated with management – baboons, Sykes and vervet monkeys. On request of hotels who are experiencing primate pest issues, an assessment is carried out by Colobus Conservation to determine areas of the hotel that contribute to these issues. The report is given to the hotels with recommendations.

Research: Carry out the standardized primate pest assessment on selected hotels in Diani and compare to previous assessment outcomes done by Colobus Conservation.

Data: Training will be given in order that hotel assessments can be done by the student to determine current levels of adherence of pest mitigations strategies. All previous assessments will be provided to the student. Some standardisation of the data will need to be done as assessment formats have changed over time.

Purpose: To determine levels of adherence by hotels of primate pest mitigation strategies and whether these have changed over time which will allow further develop of Colobus Conservation's Primate Pest Management program.

Related Research: Martin, A. 2010. *Exploring capacity of eco-hotels for the conservation of the endangered Sri Lankan grey langur (*Semnopithecus priam thersites*).* Department of Anthropology and Geography. Dissertation, Oxford Brookes University.

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8. Baboon use of natural and human provided food in Diani's suburban environment

Degree: Bachelors or Masters

Background: Three studies (2003, 2010, 2016) have been carried out on the baboon groups in Diani to determine rates of feeding on natural foods compared to foods provided by people such as from kitchens, restaurants and rubbish pits.

Research: Compare the feeding and ranging data between the three studies to investigate the variables that may account for the increase in the Diani baboon population between 2003 and 2016.

Data: The data from the three studies will be provided. Some GIS work will be required to compare and contrast the home range differences over time and the location of key human-provided food sources.

Purpose: To understand if human-provided food sources is a possible factor that explains increases in the baboon population over time. If so, mitigations can be put in place to reduce accessibility to these resources in order to manage the conflict between the community and the baboons.

Related research: Heinicke, S., 2013. *Diet and spatial ecology of yellow baboons (*Papio cynocephalus*) in a human-dominated environment in Diani, Kenya.* Master of International Nature Conservation, Georg-August University Göttingen.

9. Effectiveness of de-snaring activities on the snaring of four primate species

Degree: Bachelors or Masters

Background: Since Colobus Conservation began in 1997, 37 incidences of snaring of primates has been observed. As a response to snaring, de-snaring activities have been carried out by Colobus Conservation in certain focal areas.

Research: An analysis is required comparing the locations of the snaring incidences with the de-snaring activities to determine the effectiveness of this mitigation. In addition, an animal welfare analysis should be undertaken to identify patterns of species, age, sex, season and survivorship of snared individuals.

Data: The animal welfare data and location data of snaring incidences and de-snaring activities will be provided. Some GIS analysis will be required.

Purpose: To understand if there is a pattern of snaring and whether the de-snaring activities are effective to reduce the frequency of snaring.

Related Research: No previous research on this topic known.

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10. Domestic dog attacks on primates in Diani

Degree: Bachelors or Masters

Background: Most Diani residents have at least one dog. This is an unnaturally high level of primate predator density. Sixty dog attacks on primates have been recorded in Diani since 1997. In some studies, domestic dogs are considered to be detrimental to primate populations however the conservation risk to Diani's primates has not yet been studied.

Research: To review the pattern of dog attacks on primates in terms of species, age and sex. Location pattern of attacks needs to be compared to dog density in Diani.

Data: The animal welfare information for dog attacks on primates will be provided to the student as well as the dog density data for 2015/2016. There will be some GIS analysis required.

Purpose: To determine the extent of the conservation risk on the different primate species by domestic dogs.

Related research: Hughes, J. and MacDonald, D.W., 2013. *A review of the interactions between free-roaming domestic dogs and wildlife.* Biological Conservation 157: 341–351.

11. Release of a group of orphan Colobus monkeys after rehabilitation

Degree: Masters

Background: Colobus Conservation rescues orphan and abandoned colobus monkeys. These monkeys go into a social group that is then released. A group of three individuals will be released in Tiwi Forest, a few kilometres from Diani in April 2017.

Research: The student will analyse behavioural and feeding data on the released colobus group.

Data: The student will collect behavioural data on all three individuals and background information on the released individuals and rainfall data will be provided. The student will need to organise identification of plant species for the feeding behaviour with a local botanical expert which Colobus Conservation will assist.

Purpose: To determine if an integrated group of orphan and abandoned colobus monkeys can survive on release which will provide important information for the management of our rehabilitation project and for increasing the effectiveness of future releases.

Related research: http://www.ndegenews.com/2014/10/moving-the-colobus-to-karura-forest/

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12. Release of a group of orphan Sykes monkeys after rehabilitation

Degree: Masters

Background: Colobus Conservation rescues orphan and ex-pet Sykes monkeys. These monkeys go into a social group that is then released. A group of five individuals was released on the Colobus Conservation property in July 2016 and data has been collected by staff and volunteers.

Research: The student will analyse the behavioural data on the released Sykes group.

Data: The student will receive the data and background information on the released individuals and the rainfall data for Diani.

Purpose: To determine if an integrated group of orphan and ex-pet Sykes monkeys can survive on release which will provide important information for the management of our rehabilitation project.

Related research: Moinde, N.N., Higashi, M.A., Hau, H., 2004. *Habituation, capture and relocation of Sykes monkeys (*Cercopithecus mitis albotorquatus*) on the coast of Kenya*. Animal Welfare. 13(3) 343-353.

13. Non-lethal domestic dog-primate interactions

Degree: Masters or Doctorate

Background: Preliminary data suggests that domestic dog attacks on Diani primates may not be a high conservation risk, however, we do not understand the non-lethal effects of domestic dogs on primates which may pose a threat by restricting access to foraging areas or sleeping sites.

Research: The student would follow several groups of primates and record how the groups function in a high predator environment in terms of dog avoidance behaviors.

Data: The student will collect their own data to compare and contrast primate behaviour in different groups that negotiate Diani's residential homes.

Purpose: To understand how primates negotiate a predator-dense suburban environment which appears to be a topic not yet addressed in the scientific literature.

Related research: Hughes, J. and MacDonald, D.W., 2013. *A review of the interactions between free-roaming domestic dogs and wildlife*. Biological Conservation 157: 341–351.

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14. Adult male colobus relationships in an infanticidal species

Degree: Masters or Doctorate

Background: This subspecies of colobus was thought to have uni-male, multi-female groups, however, several studies have shown that though one male groups are common, two and three adult males are also found in groups. This is unusual as this species is known to be infanticidal.

Research: Determine the relationship between the males using faecal analysis and to determine paternity of the offspring.

Data: Students will collect faecal samples from several groups of uni-male and multi-male groups to determine the relationship of the individuals.

Purpose: The results should give us a greater understanding of the social complexities especially within the context of infanticide and related immigration and emigration patterns by both males and females.

Related research: Kappeler, P.M. 2000. Primate Males: Causes and Consequences of Variation in Group Composition. Cambridge University Press.

15. Population changes over time of four species of monkeys in Diani

Degree: Masters or Doctorate

Background: Each year in October since 2004, Colobus Conservation has counted the number of colobus, Sykes, vervets and baboons in Diani to monitor changes in the population.

Research: To review the population data for each species against environmental variables such as annual rainfall and habitat changes.

Data: Census data for each species and each year will be given to the student for analysis. Other possible relevant data sets are also available such as rainfall data and number of deaths for each species as determined by the animal welfare records.

Purpose: The analysis should provide background understanding to why there are population changes of each species over time of which Colobus Conservation can develop mitigation projects against.

Related research: Morris, W.F., Altmann, J., Brockman, D.K., Cords, M., Fedigan, L.M., Pusey, A.E., Stoinski, T.S., Bronikowski, A.M., Alberts, S.C., Strier, K.B., 2011. *Low Demographic Variability in Wild Primate Populations: Fitness Impacts of Variation, Covariation, and Serial Correlation in Vital Rates.* The American Naturalist. 177(1): E-Article.

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16. Weaning in wild colobus infants to determine care protocols of colobus orphans

Degree: Masters or Doctorate

Background: Only one individual of *Colobus angolensis palliatus* in the world has been raised in captivity from infancy to adulthood. Colobus Conservation achieved this through intensive care of 'Betsy'. However, since this success, we have had continued frustrations to get other infants through the weaning process.

Research: To study the weaning process of wild colobus monkeys to determine a general pattern of this critical developmental stage.

Data: The student will collect their own data on infants through the weaning process. This may involve cross-section observations on different aged infants or long term follows on selected individuals.

Purpose: The data will be used to replicate the weaning process of wild colobus on orphan colobus that come into care at Colobus Conservation.

Related research: Zhao, Q., Tan, C.L., Pan, W., 2008. Weaning a*ge, infant care, and behavioral development in* Trachypithecus leucocephalus. International Journal of Primatology. 29:583.

17. Identification of stress through faecal parasite load analysis of colobus in forest habitats compared to anthropogenic environments

Degree: Masters or Doctorate

Background: Parasite load is considered an indicator of habitat stress in primates. A 2006 study of parasite load in Diani's colobus showed that there was no significant difference in groups across Diani however, ground travel of these normally arboreal monkeys was implicated in high parasite load.

Research: To determine whether different vegetation types and anthropogenic environments vary with colobus stress levels as suggested by varying parasite load.

Data: The student will collect faecal samples from the primates in the suburban environment of Diani and from those in various natural forest settings near Diani and carry out parasite analyses in the Colobus Conservation veterinary clinic.

Purpose: There is some suggestion in the literature that urbanised primates behave in unusual ways due to stress associated with the anthropogenic environment. This study will determine the degree to which this assumption is correct for the colobus in Diani.

Related Research: Okanga, S., Muchemiz, G., Maingia, N., Mogoa, E., Munene, E. (2006) *Gastrointestinal parasites of free-ranging colobus monkeys (*Colobus angolensis palliatus*) in Kwale District, Kenya coast*. Afr. J. Ecol., 44, 410–412.

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18. Stress levels of primates in varying habitats and anthropogenic environments

Degree: Doctorate

Background: In 1999, Morton studied cortisol and ketone levels in Diani's colobus which looked at dry season stress.

Research: Almost twenty years later, redoing Morton's study would allow a greater understanding of the stress of colobus as anthropogenic development has massively taken place during that time period. This study could be extended to compare suburban colobus to forest colobus populations in the area.

Data: The student will collect faecal samples from selected habitats in and around Diani. The study will include a laboratory analysis to determine cortisol and ketone levels.

Purpose: By comparing and contrasting the levels of cortisol and ketone levels of this study to Morton's study and between sampled areas, this analysis will give a better understanding of the role of the anthropogenic disturbance and vegetation degradation on colobus stress.

Related research: Morton, D.C., 1999. *Analysis of cortisol and urinary ketone levels of Angolan colobus (*Colobus angolensis palliatus*) as a measure of dry season stress in Diani, Kenya*. Honor's Program in Environmental Studies, Dartmouth College.

19. Videos on Colobus Conservation programmes

Activity: Produce two minute videos of which each video illustrates one area of Colobus Conservation's program areas, for example, colobridges, primate electrocutions, primates as pets. The videos can be directed at various audiences such as children, adults, businesses, granters.

Purpose: The videos will be used for marketing, increasing awareness and educational purposes.