THE SCHOOL FOR FIELD STUDIES

African Large Carnivores: Ecology and Conservation

SFS 3121

The School for Field Studies (SFS)
Center for Wildlife Management Studies (CWMS)
Karatu, Tanzania

This syllabus may develop or change over time based on local conditions, learning opportunities, and faculty expertise. Course content may vary from session to session.

www.fieldstudies.org

COURSE CONTENT SUBJECT TO CHANGE

Please note that this is a copy of a recent syllabus. A final syllabus will be provided to students on the first day of academic programming.

SFS programs are different from other travel or study abroad programs. Each iteration of a program is unique and often cannot be implemented exactly as planned for a variety of reasons. There are factors which, although monitored closely, are beyond our control. For example:

- Changes in access to or expiration or change in terms of permits to the highly regulated and sensitive environments in which we work;

- Changes in social/political conditions or tenuous weather situations/natural disasters may require changes to sites or plans, often with little notice;

- Some aspects of programs depend on the current faculty team as well as the goodwill and generosity of individuals, communities, and institutions which lend support.

Please be advised that these or other variables may require changes before or during the program. Part of the SFS experience is adapting to changing conditions and overcoming the obstacles that may be present. In other words, the elephants are not always where we want them to be, so be flexible!

Course Overview

The conservation status of many African large carnivore species is of global concern indicated by their IUCN red list status; examples include the African wild dog (endangered), African lion (vulnerable), Cheetah (vulnerable) and African leopard (vulnerable). Ecologically, large carnivores are keystone species due to their position at the top of the food chain. Frequently large carnivores can be a source of attraction and wonder, and play a major role in ecotourism industry in many African countries. At the same time, carnivores can threaten peoples' safety and livelihood through attacks on livestock which leads to persecution and retaliatory killing of carnivores by people. The negative impacts caused by carnivores also engender negative attitudes towards carnivore conservation and management in human dominated landscapes.

Carnivores have suffered significant declines in their populations across the continent due to habitat loss, depletion of natural prey and direct persecution by people. Better understanding of these factors is of special interest to provide evidence for effective conservation. Few countries in Africa parallel Tanzania in large carnivore diversity and abundance and in conservation efforts. Tanzania has at least 35 species of carnivores which is over half of the continent's carnivore species. Tanzania also has one of the highest populations of lions and wild dogs in Africa.

This four week course will focus on the behavioral ecology and conservation challenges facing large carnivores in Africa using Northern Tanzania as a case study. SFS center for wildlife management studies in Tanzania is an ideal location to explore the ecological and human aspects of large carnivore conservation. The center is located between the Ngorongoro-Serengeti (NSE) and Tarangire-Manyara (TME) ecosystems in northern Tanzania. Both ecosystems have largely intact carnivore guilds that occur within and outside the protected areas. The large carnivores are one of the main attractions to a vibrant photographic tourism industry. In addition, large carnivores attract high premiums among the trophy hunters in the area. Despite the high economic values, carnivores in northern Tanzania are under immense threats from human related effects such as habitat loss, and conflicts with pastoralists. In order to address these challenges, large carnivores have attracted high interest among conservationists and scientists in Northern Tanzania. African wild dogs, African lions, spotted hyenas, cheetahs and leopards have received high attention due to their charismatic appeal and the manifold threats facing them. Among those species, lions and leopards are among the big five, and are highly sought after by tourists. In order to address the conservation threats and better understand the ecology of these large carnivore species in Northern Tanzania, several conservation and research projects have been initiated. These include: The Tarangire Lion Research Project in Tarangire/Manyara National Parks and the surrounding areas, Kope Lion project in Ngorongoro Conservation Area, and species-specific projects in Serengeti National park focusing on lion, cheetah, spotted hyena and African wild dog.

Cheetah (*Acinonyx jubatus*)

African lion (*Panthera leo*)

Leopard (*Panthera pardus*)

Spotted hyena (*Crocuta crocuta*)

African wild dog (*Lycaon pictus*)

Major carnivore species in the Tarangire-Manyara ecosystem

This course will be offered as a case study integrating scientific and conservation related questions regarding large carnivores in the TME and NSE. The study area encompasses world famous protected areas in Northern Tanzania including Tarangire, Lake Manyara and Serengeti National parks, Ngorongoro Conservation Area, Manyara Ranch and Burunge and Randilen Wildlife Management Areas (Figure 1). These national parks and adjacent community-based conservation areas offer an ideal site to provide students with experiential field-based training in large carnivore ecology and conservation. The course will address issues related to large carnivore natural history and behavior, population dynamics and human-carnivore interactions. In the course of the program, students will learn the current issues in large carnivore conservation debate and current techniques for studying and managing large carnivores. This will be done through a combination of lectures from large carnivore experts, and field-based ecological and social research. The field training especially on ecological aspects of the course will be conducted in the protected areas as well as outside protected areas in wildlife dispersal areas in the communal land. The social surveys will include participatory social learning techniques in the villages adjacent to protected areas. The data collected will be analyzed using advanced techniques and hence will offer students social and ecological analytical skills vital for research and conservation. Research results will be communicated to relevant stakeholders to support evidence-based decision making. During this program, students will interact with wildlife experts and local community members on a daily basis. The area is primarily home to Maasai, and Iraqwi people and students will learn the historical and modern day interactions between indigenous communities and large carnivores

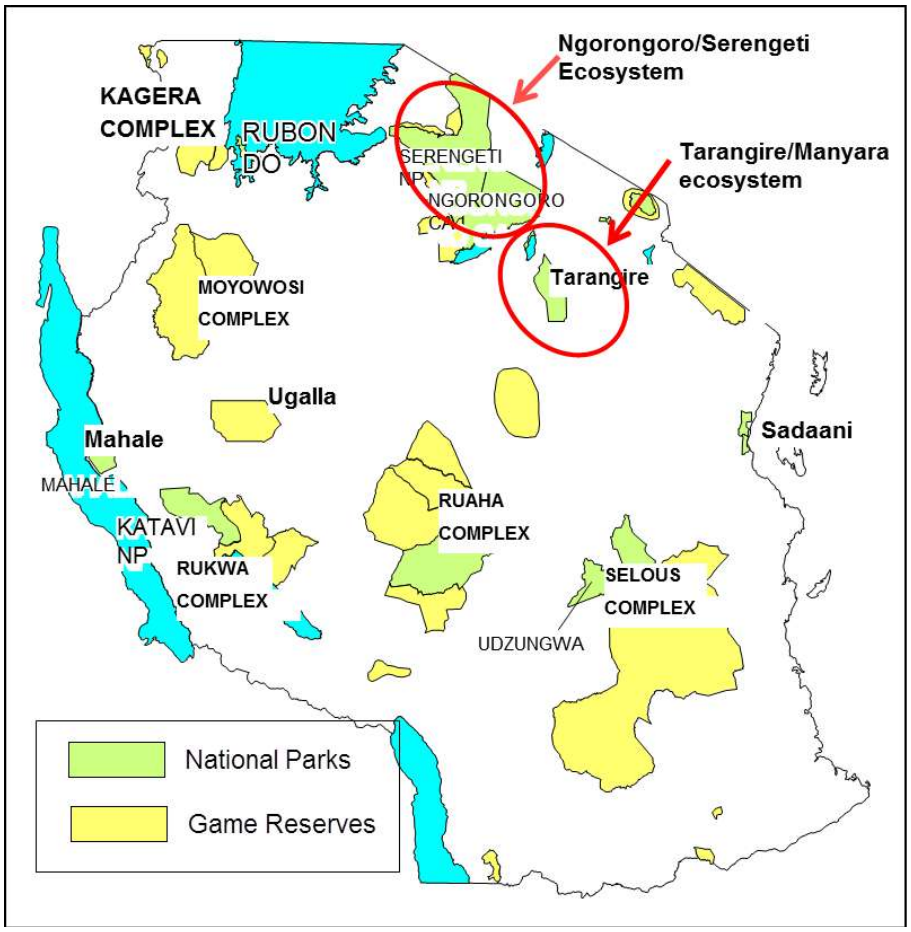


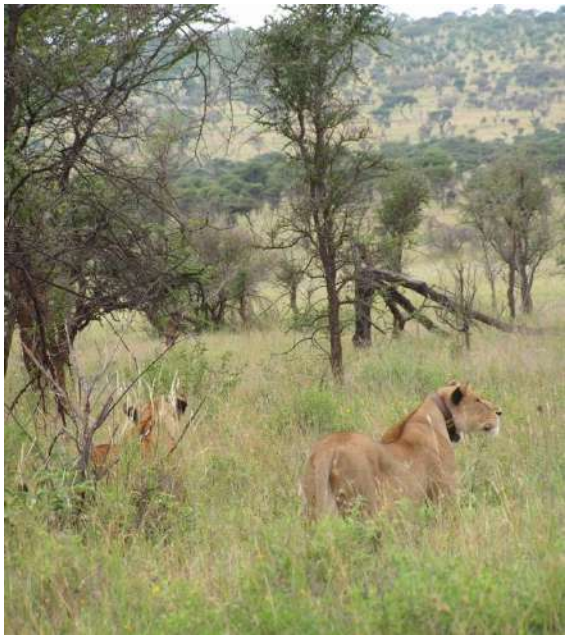
Figure 1: Map of Tanzania showing location of Ngorongoro-Serengeti and Tarangire-Manyara Ecosystems

Field training expeditions

This program will involve short one-day field expeditions to Tarangire and Manyara National parks, and a long four-day expedition to Serengeti National park. These expeditions will provide unique settings for experiential learning; due to the relatively high diversity and abundance of large carnivores, and other large mammalian prey species (such as giraffes, wildebeest, zebra, buffalo, gazelles) it will provide important avenue for studying and practicing observational skills in behavioral ecological studies and field techniques in predator-prey interaction. In Tarangire National Park students will have the opportunity to visit a field research station for Tarangire Lion Project and learn about the project activities.

Left: Field research station for Tarangire Lion Project in Tarangire NP.
Right: SFS students during a visit to the lion research station in Sept. 2017

Tarangire Lion Project is a long-term field research and conservation project that has been operating in the area for over fifteen years. The project has been involved in lion research and conservation work in the Tarangire-Manyara Ecosystem. Through monitoring the project has been collecting data on the ecology, demography and seasonal movement from protected areas across into the communal land. The project has also been working with pastoralist Maasai communities on issues of human-carnivore conflicts and implementation of conflict mitigation strategies. At the lion field research station students will learn various techniques such as VHF and GPS based telemetry used for long-term carnivore research and how such techniques contribute to the understanding of species' behavioral, ecological, demography and human-carnivore conflicts.



Female lion fitted with a radio collar

Learning Objectives

The overall objective of the course is to equip students with adequate knowledge on behavioural ecology and the current management and conservation issues related to large carnivores in northern Tanzania with some references from other African countries where similar species occur. The course is tailored to provide students with knowledge and skills for evidence-based large carnivore research and conservation. The course has the following specific objectives:

I. To gain knowledge on behavioral ecology and life histories of carnivores in a savanna ecosystem
II. To understand the threats and conservation approaches for carnivores in a savanna ecosystem
III. To develop skills for conducting ecological and social research and monitoring for carnivores species (including behavioral observation, predator-prey interactions, human-carnivore interactions, density and abundance estimates)
IV. To understand how local people interact with carnivores in northern Tanzania, and survey potential conflict mitigation strategies

Assessment

The evaluation breakdown for the course is as follows:

Assessment Item	**Value (%)**
Literature review and presentation: The conservation status of large carnivores	20
FEX Report: Large carnivore feeding habits	20
Survey and report: Human-carnivore interactions	20
FEX Poster: Monitoring carnivores using camera traps	20
Analysis and presentation: Home range and space use	20
TOTAL	**100**

Description of Assignments

The conservation status of large carnivores in Africa (20%): In this assignment students will analyze the conservation status of major carnivores (lions, cheetah, hyena and wild dog) based on a thorough literature survey. The students will prepare a 3-5 page group report, and present their results to the class. The aim of this assignment is to provide students with skills on scientific literature synthesis and presentation skills. The grading will be group based, on both the written paper and presentation.

Large carnivore feeding habits (20%): This field exercise will be undertaken in Ngorongoro Conservation Area and Serengeti National Park. Within four days during the expedition, students will make field observations on the prey killed by larger carnivores. At the same time students will undertake counts of large mammal prey species, so as to compare carnivore prey choice and prey availability. A short scientific paper will be written by each student.

Human-carnivore interactions (perception and attitude survey) (20%): This assignment will be based on a study in Karatu, Monduli and Babati districts involving social surveys with communities to assess the perception and attitudes towards large carnivores and carnivore conservation. Faculty will facilitate focus group discussions where students can interact and ask questions to community members. Students will work in groups; practice social research skills for data collection and analysis. A brief report will be written to synthesize and interpret the data.

Monitoring large carnivores using camera traps (20%): This field exercise will be conducted adjacent to the CWMS campus at Moyo Hill. Camera traps will be set up and monitored over a period of 5-10 days. The data will be entered into the computer and analyzed using database techniques and statistical methods taught during computer labs. Student groups will prepare a poster based on the results. The poster will be presented in class

Analysis of home ranges and spatial behavior of lions (20%): This exercise will be conducted as a computer laboratory using the long-term telemetry (VHF and GPS collars) datasets from the Tarangire Lion project to analyze the seasonal variation in home ranges and spatial use pattern of lion prides in the Tarangire-Manyara landscape. The analysis will use quantitative techniques and geospatial modeling tools for home range analysis. Students will learn analytical skills for ecological datasets for wildlife species. A presentation will be prepared by each group.

Grade corrections in any of the above items should be requested in writing at least 24 hours after assignments are returned. No corrections will be considered afterwards.

Grading Scheme

A	95.00 – 100.00%	B+	86.00 – 89.99%	C+	76.00 – 79.99%	D	60.00 - 69.00%
A-	90.00 – 94.99%	B	83.00 – 85.99%	C	73.00 – 75.99%	F	59.99 - 0.00%
		B-	80.00 – 82.99%	C-	70.00 – 72.99%		

General Reminders

Readings: Assigned readings and hand outs (exercises/assignments) will be available prior to the scheduled activities. Course readings must be read and clarification on issues sought where necessary since ideas and concepts contained in them will be expected to be used and cited appropriately in assigned course essays and research papers.

Plagiarism: using the ideas or material of others without giving due credit is cheating and will not be tolerated. A grade of zero will be assigned for anyone caught cheating or aiding another person to cheat either actively or passively (e.g. allowing someone to look at your exam).

Deadlines: Deadlines for written field exercises and other assignments are posted to promote equity among students and to allow faculty ample time to review and return assignments in good time. As such, deadlines are firm and extensions will only be considered under the most extreme circumstances. Late assignments will incur a 10% penalty for each hour that they are late.

Participation: Since we offer a program that is intensive, missing even one lecture can have a proportionally greater effect on your final grade simply because there is little room to make up for lost time. Participation in all components of the program is mandatory because your actions can significantly affect the experience you and your classmates have while at CWMS. Therefore, it is important that you are prompt for all course activities.

Course Content

Type- **L**: Classroom lecture, **FL:** Field lecture, **FEX:** Field Exercise, **D:** Class discussions, **Lab:** class exercise, **SP:** Students Presentation, **GL** Guest lecture

Title and Outline	*Type*	*Hours*
COURSE OVERVIEW This is an introductory lecture on the course content, schedule, assignment and grading protocols. It will set the general expectations for this course.	L	2
Status and conservation of large carnivores in East Africa This lecture will set the case for the current status and conservation of large carnivores in Tanzania and other East African countries highlighting the threats and plight to large carnivore populations including challenges from habitat loss, conflicts, trophy hunting etc.	L	1.5
Case study of the human-carnivore conflicts in Tarangire-Manyara ecosystem The class will explore the extent, pattern, and impacts of human-carnivore conflicts in the TME. It will also highlight various efforts towards conflict mitigation involving the local pastoralist communities.	L	1.5

Title and Outline	*Type*	*Hours*
Traveling lecture: Large carnivores in human dominated landscapes During this travelling lecture, students will be exposed to challenges related to coexistence of large carnivores in human-dominated landscapes.	FL	5
The behavioral ecology of large carnivore species This class will involve a series of lectures providing students with the basic insights into the natural history, behavior and ecology of select major carnivore species in the African savannah including hyena, lion, leopard, cheetah and wild dog. One hour lecture on each species will be given.	L	5
Socio-survey techniques for large carnivore studies This lecture will introduce social study techniques and protocol for conducting research and management of large carnivore populations. The students will specifically learn how to design a structured questionnaire and conducting Focus Group Discussion (FGD).	L	2
Human-carnivore interactions (BK/JM) Students will undertake a field survey in the TME to investigate the scale of interactions between large carnivores and livestock, focusing on conflict and mitigation measures. The survey will also assess attitude and perceptions of conflicts by local communities. Students will analyze the data collected and present the results.	FEX	5
Field research experience and operations for large carnivore species This will be a case-study field lecture where students will visit the Tarangire Lion Research Project base Camp in Tarangire Park to interact with project staff and get first-hand information on how on the logistical and operational aspects involving large carnivore field research project. The aim is to provide students with experiential learning about large carnivore research in the African context using the lion project as a case study.	FL	2
Field techniques for monitoring large carnivores This lecture covers the techniques used for short term and long term carnivore population monitoring such as camera trapping, radio telemetry, signs/indices, and call backs. The lecture will highlight how such techniques have been applied in northern Tanzania.	L	1.5

Title and Outline	*Type*	*Hours*
Analysis of home ranges and spatial behavior of lions This computer laboratory will use long-term telemetry (VHF and GPS collars) datasets from the Tarangire Lion project for students to practice and learn techniques to analyze home range and space use data using lion prides in the Tarangire-Manyara landscape.	Lab	4
Monitoring large carnivores using camera traps This field exercise will be conducted on the CWMS campus at Moyo hill. Students will be involved in setting up of camera grids, monitoring and retrieving data from the cameras, setting up a database and entering the data into the computer. This will allow students to practice the use of camera traps as a field technique for carnivore studies.	FEX	6
Analysis of camera trap data During this computer lab, students will learn how to analyze abundance and relative space use of large carnivores based on existing camera trap data collected in Manyara NP.	Lab	3
Field exercise on radio telemetry This exercise will involve field demonstration, practice and using radio telemetry in the field. A follow-up computer laboratory will use the existing long-term dataset collected using telemetry technique to analyze home range and space use by Tarangire lions.	FEX	6
Large carnivore disease epidemiology This will be a Guest lecture by a wildlife veterinarian /researcher working on aspects related to wildlife diseases in northern Tanzania with particular emphasis on carnivore diseases. The lecture aims to highlight the economic importance of diseases to long-term carnivore conservation.	L	1.5
Large carnivore behavior I: Large carnivore prey selection This field exercise will be undertaken in Ngorongoro Conservation Area and Serengeti National Park. This aims to expose students to understanding predator-prey selection among large carnivores.	FEX	6
Large carnivore behavior II: Carnivore diurnal behavior Students will undertake behavioral sampling of several carnivore species encountered within protected areas during field visits. This information will be used to develop time budgets for the observed species.	FEX	6
Lion population dynamics This lecture will be based on a case study of the long-term lion population regulation of the Ngorongoro crater lions.	L	1.5

Title and Outline	Type	Hours
Hyena population dynamics in the Ngorongoro crater northern Tanzania Population size, age-sex structure, and reproductive behavior in Ngorongoro crater.	FL	6

Reading List

Bauer, H., Packer, C., Funston, P.F., Henschel, P. & Nowell, K. (2016). *Panthera leo* (errata version published in 2017). *The IUCN Red List of Threatened Species 2016*. Web. 10 February 2018.

Durant, S., Mitchell, N., Ipavec, A. & Groom, R. (2015). *Acinonyx jubatus*. *The IUCN Red List of Threatened Species 2015*. Web. 10 February 2018.

Estes, R. D. (1991). Behavioral Guide to African Mammals including Hoofed Mammals, Carnivores and Primates. Russel Friedman Books Publishers: South Africa. 611pp

Hanby, J.P., Bygott, J.D. & Packer, C. (1995). Ecology, Demography and Behaviour of Lions in two Contrasting Habitats: Ngorongoro Crater and the Serengeti Plains. *Serengeti II: Dynamics, Management and Conservation of an Ecosystem*. University of Chicago Press: USA. pp315-331

Holekam K.E., Sakai, T. S., Lundrigan, L.B., (2007). Social Intelligence in the Spotted Hyena (*Crocuta crocuta*). *Philosophical Transactions of the Royal Society B*: 362 pp523-538

Kingdon, J. (1997). The Kingdon Field Guide to African Mammals. A.P., London.

Kissui, B. M. (2008). Livestock Predation by Lions, Leopards, Spotted Hyenas, and their Vulnerability to Retaliatory Killing in the Maasai Steppe. *Animal Conservation*: pp422-432

Kissui, B.M., Packer,C. (2004). Top-Down Regulation of a Top Predator: Lions in the Ngorongoro Crater. *Proceedings of the Royal Society of London B:* 271 pp1867-1874

Micaela et al., (2007). Courtship and Mating in Free-Living Spotted Hyenas. *Behaviour:* 144, pp815-846.

Msoffe, F. et al. (2011). Spatial Correlates of Land-Use Change in the Maasai-Steppe of Tanzania: Implications for Conservation and Environmental Planning. *International Journal of Biodiversity and Conservation:* 3, pp280-290.

Packer, C., Scheel, A., Pusey, A. (1990). Why Lions Form Groups: Food in Not Enough? *American Naturalist* 136 (1): pp1-19

Woodroffe, R., Ginsberg, J.R. (1999). Conserving the African Wild Dog *Lycaon Pictus* I: Diagnosing and Treating Cause of Decline. *Oryx* 33: pp132-142