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23 June 2022

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From May 19 – June 7, personnel from the UW Department of Zoology & Physiology organized a three-week, intensive field course entitled "Ecology and Conservation of African Savannas" at the Ewaso Ng'iro campsite on the grounds of Mpala Research Centre (MRC) in Laikipia County in central Kenya (Map 1).

2022 UW Ecology & Conservation of African Savannas field course. Back row: Sophie Culver, Devin Gearhart, Jake Goheen, Mike Pieper, George Opiyo, Ryen Nielsen, Dylan Scherer, Samuel Wicks, Jesse Alston, Atticus Klass. Front row: Darian Hale, Celine Wandia, Ema Lujan, Angela Zhu, Kellyn Chandler, Leo Khasoha, Zoe Short.

The goal of our course was to expose UW students to study formulation, data analysis, and field practices in wildlife ecology, in a one-of-a-kind setting. Our course provided unique learning opportunities to UW students that are not currently available on campus. Twelve UW students and two Kenyan students were immersed in the study of the ecology and conservation of savanna wildlife (mammals and birds, principally). Students were exposed to a variety of topics

provided by professors, graduate students, and local experts in the conservation of endangered species. Students, instructors, and special guests are listed in Table 1.

Table 1. Students and Instructors.

Jesse Alston, instructor, Center for Advanced Systems Understanding, Görlitz, Germany
Kellyn Chandler, student, UW
Sophie Culver, student, UW
Devin Gearhart, student, UW
Jake Goheen, instructor, UW Dept Zoology & Physiology
Darian Hale, student, UW
Atticus Klass, student, UW
Leo Khasoha, instructor, UW Dept Zoology & Physiology
Ema Lujan, student, UW
Ryen Nielsen, student, UW
George Opiyo, student, National Museums of Kenya
Mike Pieper, student, UW
Dylan Scherer, student, UW
Zoe Short, student, UW
Celine Wandia, student, Kenyatta University
Samuel Wicks, student, UW
Angela Zhu, student, UW

Special guests.

Ali Hassan, research assistant, Mpala Research Centre
Simon Lima, research assistant, Mpala Research Centre
Sam Mutisya, Ecological Monitoring Unit, Ol Pejeta Conservancy
Wilson Nderitu, research assistant, Mpala Research Centre
Dedan Ngatia, PhD student, UW Dept Zoology & Physiology
Douglas Njeri, PhD student, UW Dept Zoology & Physiology

Laikipia is comprised of a mosaic of large ranches, small land holdings, and agricultural parcels in which wildlife, livestock production, and agricultural economies vie for limited resources. Despite lacking formal protection, Laikipia boasts the highest abundances of wildlife in Kenya outside the famed Maasai Mara National Reserve, thus providing a model for human-wildlife coexistence outside national parks.

The MRC was the logistical hub for our field course. The MRC is situated within the 48,000 acre Mpala Conservancy, and provides 24-hr security and basic science facilities consisting of labs and associated infrastructure.

Course Description

Our course was designed around several goals and foundations, and consisted of a combination of short lectures, field observations to test the material, hands-on field techniques, exchanges with people from local villages, student-driven research projects and presentations, and wildlife viewing.

Goals and Foundations

(1) Gain knowledge and further appreciation for the ecology and conservation of savanna wildlife.

(2) Appreciate challenges and opportunities inherent to research in wildlife ecology and conservation.

(3) Use case studies in savannas to comprehend classic and contemporary issues in the conservation, ecology, and evolution of biodiversity, with emphasis on mammals and birds.

(4) Gain experience in a variety of field techniques for sampling biodiversity, including trapping of small mammals and ungulates, mist-netting of songbirds, radio-telemetry, and GPS methods.

Our course was built around four pedagogical foundations.

(1) Active Learning. One of the shortcomings of undergraduate education in the sciences is that students can become adept at passively answering, rather than actively asking questions. This leaves students with the impression that science is just the accumulation of facts rather than a process through which knowledge is generated. To facilitate active learning, students worked in small groups to initiate and complete independent projects over the 3-week time frame. These projects truly were “independent”; students generated research questions, designed methods to test questions, and analyzed and presented their results. This year, students developed projects to (a) investigate how fear of leopard predation by a

common antelope (impala) changed tree composition and cover; (b) understand whether and how world's most abundant bird (red-billed quelea) decided where to roost based on elephant presence; and (c) measure nest-site selection by common songbirds for trees occupied by different ant mutualists.

(2) Hands-on Field Activities. Our course entailed daily, learn-by-doing activities geared toward students majoring in wildlife management and zoology (Table 2). Central to this course was hands-on experience, both in terms of field activities and the practice of doing science.

(3) Diversity and Experience of Instructors. Because of the rapport we have developed with landowners in Laikipia and professionals in Kenya in general, our course features discussions and activities with personnel from Ol Pejeta Conservancy, Kenyan and UW graduate students, and tribal groups. At MRC, we were able to perform fieldwork and the aforementioned hands-on activities that would not otherwise be permitted.

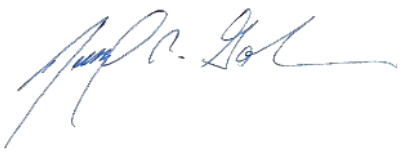
(4) Reciprocity. Western scientists and educators have an obligation to involve citizens of the countries in which they hold courses, both because it strengthens long-term relationships and because it is the ethical thing to do. Our field course represents a training partnership between UW and young professionals in Kenya. So, two Kenyan citizens joined our 12 UW students, and the resulting exchanges significantly enhanced the course.

Funding and Support

Expenses associated with this course were partly defrayed by the UW Department of Zoology and Physiology, the UW College of Arts and Sciences, the UW Global Engagement Office, and the UW Biodiversity Institute (with whom we are partnering to support this course in the future). The Mpala Research Centre graciously and fully defrayed expenses associated with two Kenyan students, George Opiyo and Celine Wandia. As always, the staff at the Ewaso Ng'iro campsite were second-to-none, and were responsible for keeping us safe and well-fed. We especially thank Dino Martins, Cosmas Nzomo, Fardosa Hassan, and Aziz Ekuam for their assistance and hospitality.

Please do not hesitate to contact me if you have questions or require further information.

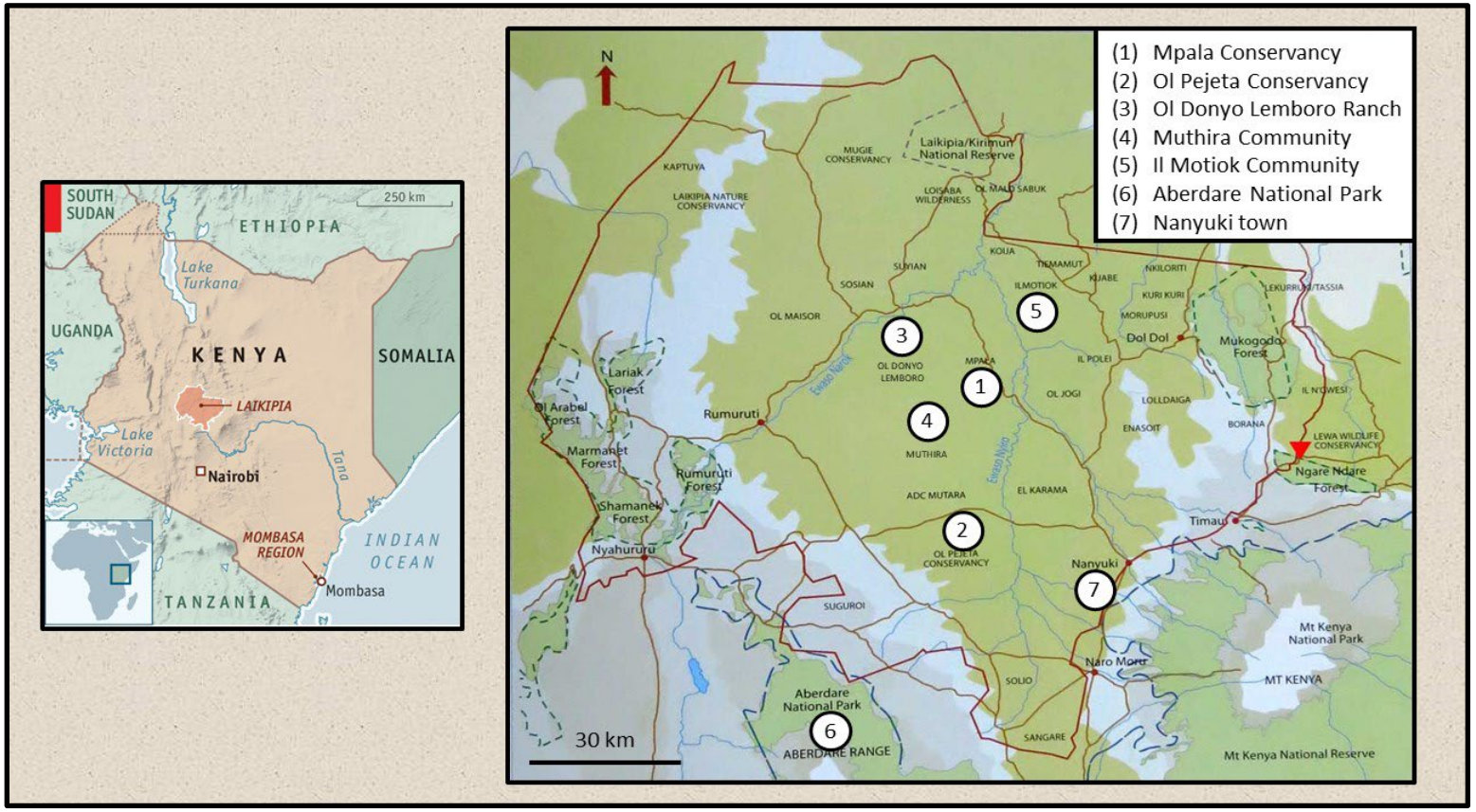
With thanks and gratitude,



Jake Goheen
Professor of Zoology
jgoheen@uwyo.edu

day	early am	late am	early pm	late pm
1	flight KA 3L 1030am	travel to Mpala	introduction/safety briefing	X
2	sleep/game drive	sleep/game drive	set mammal traps	fireside chats
3	check mammal traps/drive transects for density estimation of ungulates/bird netting and ID	Jake walk n' talk (Goheen and Palmer)--acacia ants	set mammal traps/drive transects for density estimation of ungulates/climb mukenya/hippo pools	X
4	check mammal traps/drive transects for density estimation of ungulates/bird netting and ID	Jesse lecture (Kihwele et al)--correlates of body size in ungulates	set mammal traps/drive transects for density estimation of ungulates/climb mukenya/hippo pools	happy birthday Darian! night drive
5	check mammal traps/drive transects for density estimation of ungulates/bird netting and ID	Jake lecture (Ford et al)--predation risk and plant defense	set mammal traps/drive transects for density estimation of ungulates/climb mukenya/hippo pools	X
6	check mammal traps/drive transects for density estimation of ungulates/bird netting and ID	Dedan lecture--conservation of African wild dogs	set mammal traps/drive transects for density estimation of ungulates/climb mukenya/hippo pools	fireside chats
7	check mammal traps/drive transects for density estimation of ungulates/bird netting and ID	Leo walk n' talk (UHURU)	set mammal traps/drive transects for density estimation of ungulates/climb mukenya/hippo pools	X
8	check mammal traps/drive transects for density estimation of ungulates/bird netting and ID	Ol Pejeta--lion radio-tracking/lecture on rhino conservation	Ol Pejeta--lion radio-tracking/lecture on rhino conservation	fireside chats
9	Leo lecture--the abundance-occupancy relationship in small mammal communities	Ol Donyo Lemboro--African wild dog darting and capture	Ol Donyo Lemboro--African wild dog darting and capture	X
10	Nanyuki trip--Mt. Kenya wildlife conservancy and mountain bongo conservation; animal orphanage, spinners and weavers	Nanyuki trip--Mt. Kenya wildlife conservancy and mountain bongo conservation; animal orphanage, spinners and weavers	Nanyuki trip--Mt. Kenya wildlife conservancy and mountain bongo conservation; animal orphanage, spinners and weavers	fireside chats
11	dik-dik capture and net set-up	distance and capture-mark-recapture analyses	independent projects	independent projects
12	Muthira community--dancing, school visit	Muthira community--dancing, school visit	Muthira community--dancing, school visit	night drive
13	dik-dik capture and net set-up	distance and capture-mark-recapture analyses	independent projects	attempted bat netting
14	Il Motiok community--beadmaking, home visit	Il Motiok community--beadmaking, home visit	independent projects	attempted bat netting, part deux

15	dik-dik capture and net set-up	distance and capture-mark-recapture analyses	independent projects	drinks at Baculi Dam
16	dik-dik capture and net set-up	distance and capture-mark-recapture analyses	project data analyses	drinks at Baboon Cliffs
17	project data analyses	project wrap-up	project presentations	goat roast
18	Aberdare National Park	Aberdare National Park (the Ark)	Aberdare National Park (the Ark)	Aberdare National Park (the Ark)
19	Abderdare National Park (Ol Donyo Lesatima)	Abderdare National Park (Ol Donyo Lesatima)	Aberdare National Park (fishing lodges)	Aberdare National Park (fishing lodge)
20	Aberdare National Park (Chania Falls)	travel	Nairobi shopping/whatnot	flight

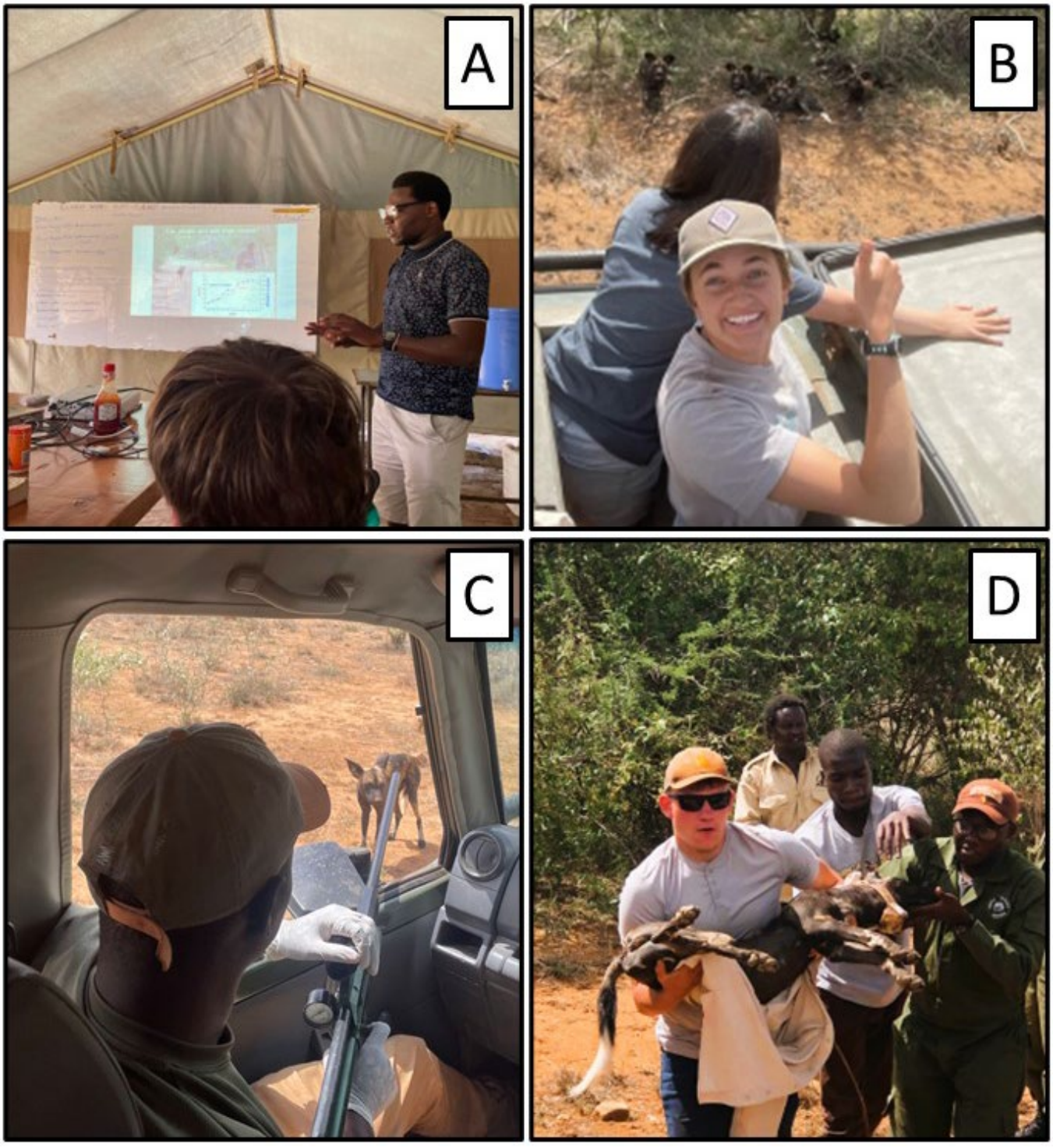


Map 1. Unless otherwise stated, our field activities and lectures occurred on the Mpala Conservancy (1).

A fawn, doe, and buck Thomson's gazelle, with a black-winged lapwing in the foreground. Thomson's gazelle are one of two species of gazelle in Laikipia. Ol Pejeta Conservancy.

Ryen Nielsen, Angela Zhu, Darian Hale, and Atticus Klass learn the finer points of beadwork from Laikipiak Maasai. Il Motiok Community.

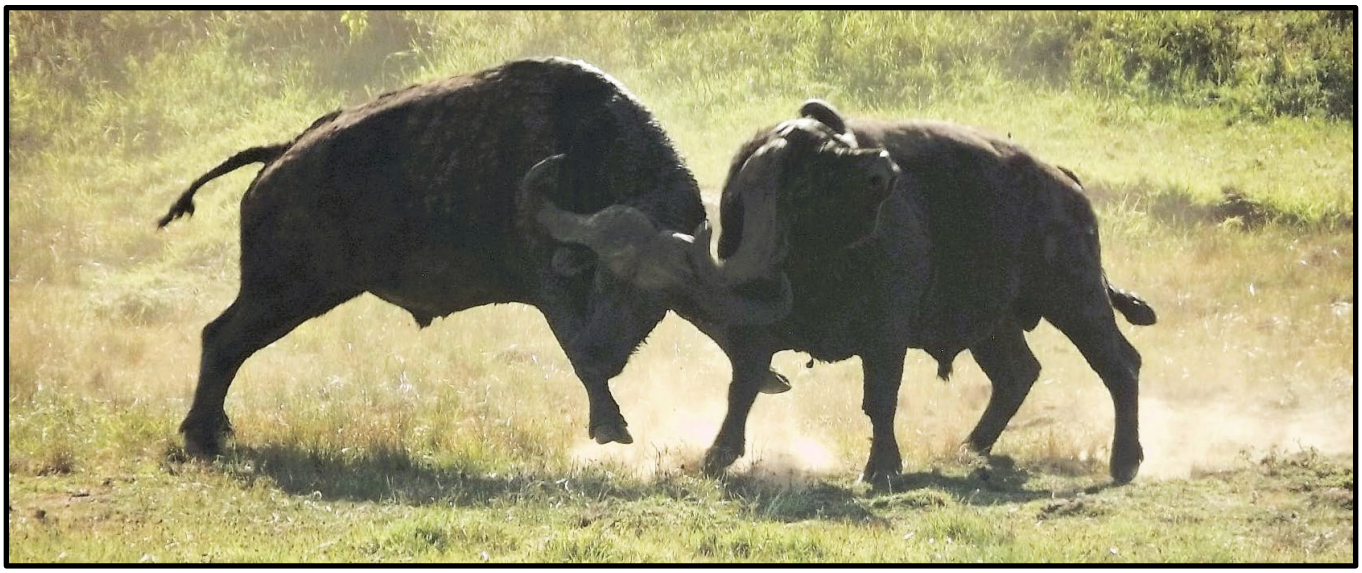
Sophie Culver deftly removes a Von der Decken's hornbill from a pull trap.



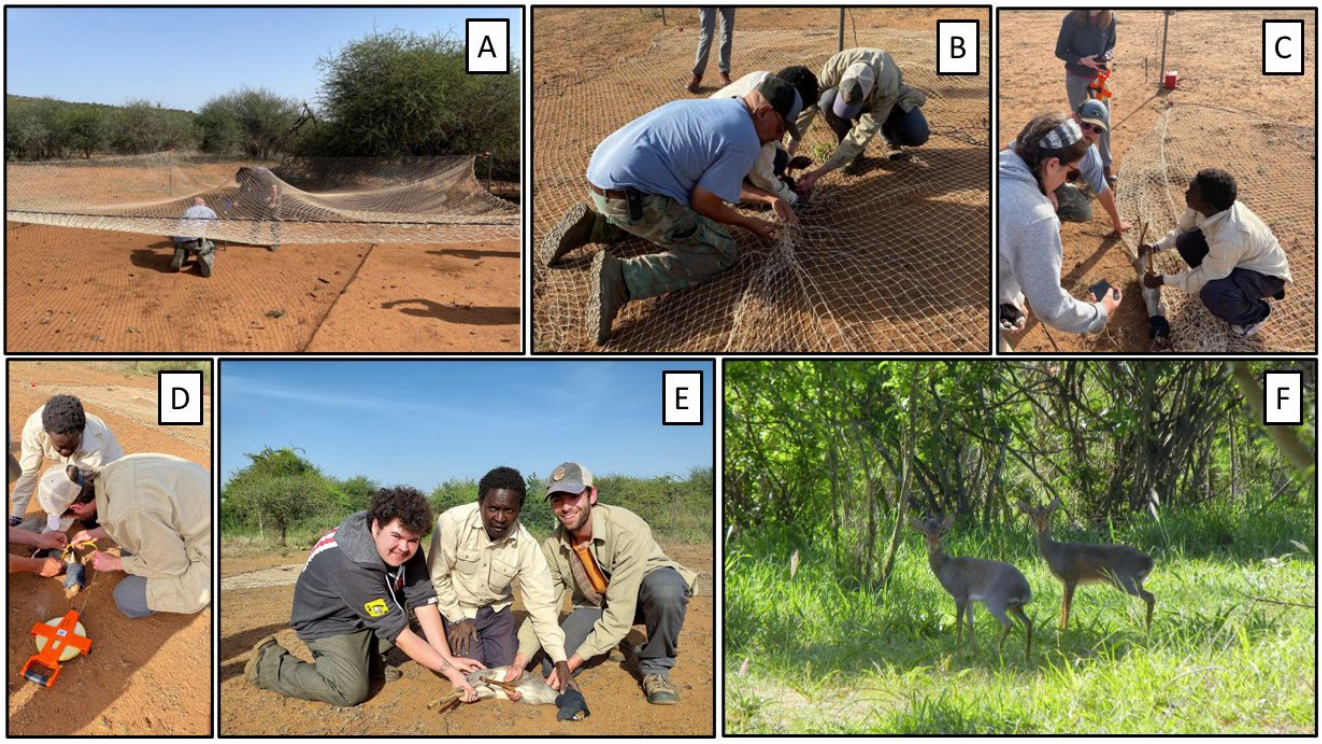
Our class was fortunate to learn from an expert in the ecology and conservation of African wild dogs, Dedan Ngatia. (A) We learned that African wild dogs could coexist with people and their livestock, if the domestic dogs that accompany herders are vaccinated against distemper and rabies (both of which are readily transmitted to African wild dogs). (B) Angela Zhu and Kellyn Chandler are tickled to get a good look at a pack of 13 individuals. (C) Matthew Mutinda from the Kenya Wildlife Service prepares to dart the alpha male to replace its GPS collar. (D) Atticus Klass, Simon Lima, George Opiyo, and Dedan Ngatia carry the immobilized individual to the processing station. Ol Donyo Lemboro Ranch.

This is what it sounds like when the doves cry. Samuel Wicks handles a ring-necked dove caught in a mist net.

Verdant scenery outside our tents at the Ewaso Ng'iro campsite. Yellow fever trees (like those on the left) were so named because they are associated with malaria cases, which is coincidental: both the trees and the mosquitos that carry malaria are prevalent alongside rivers.

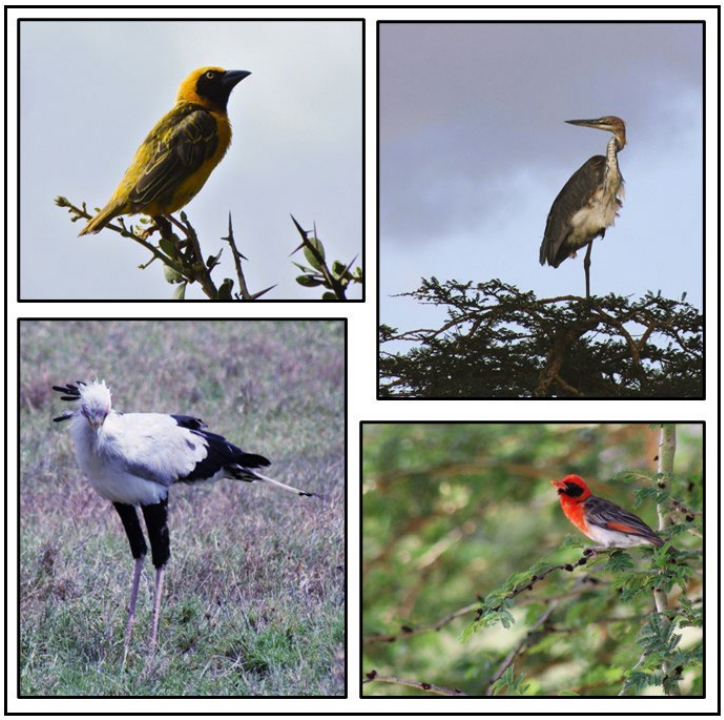


A throwdown between two male buffalo. African buffalo (not water buffalo!) occur south of the Sahara across much of the continent, and are rather feisty: they account for ~200 deaths annually, which probably is more than hippos and crocodiles combined.



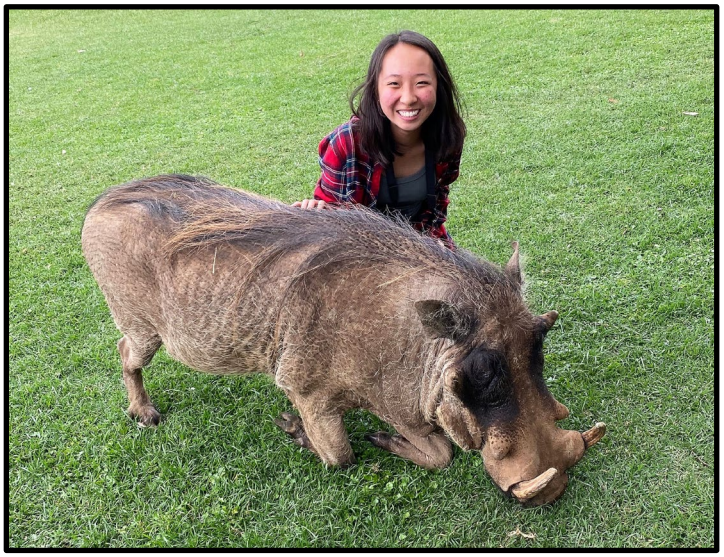
Our class learned how to capture and handle ungulates (hooved mammals). (A) We set a drop net, baited with delicious, fresh-cut *Grewia* twigs. Then we waited patiently. (B) Once the net was dropped, we hustled to restrain the individual, blindfolding it and taking care with its pencil-thin legs. (C) Individuals were removed from traps before (D) measuring body length, neck circumference, and girth. (E) Ryen Nielsen (left) and Samuel Wicks (right) pause for the obligatory photo, while dik-dik fundi Simon Lima (center) looks for leopards that could be attracted to the dik-dik's squeals. (F) Embarrassed but otherwise unscathed, the Guenther's dik-dik reunites with her partner, with whom she has mated for life.

Misty mountain hop. We went on a grueling but gorgeous hike among giant lobelias, charismatic megaflora that look like a cross between palm trees and plants from a Dr. Seuss story. This species is semelparous—it produces hundreds of thousands of seeds once in its lifetime, then dies. It is pollinated by sunbirds, a group of nectarivorous birds convergent with hummingbirds. Aberdare National Park.

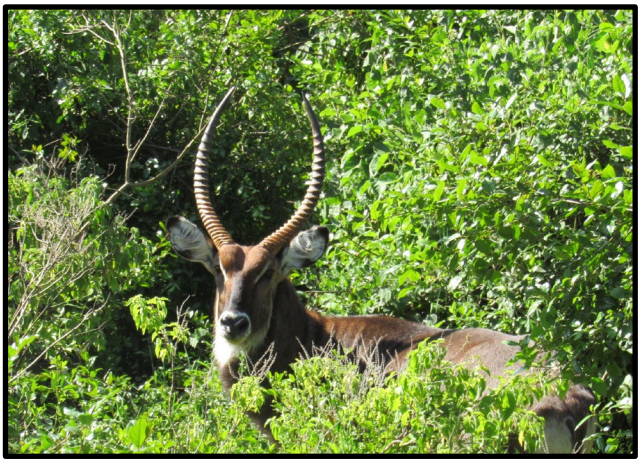


Fantastic birds and where to find them. Clockwise from top left: Speke's weaver, goliath heron, red-headed weaver, secretary bird.

Keystone species have disproportionately large effects within their environments, relative to their biomass. Ecosystem engineers affect other species by altering the abiotic conditions in which they occur. By obliterating a whistling-thorn tree, Mike Pieper attempts to simulate both at the same time.



Angela Zhu befriends Wilbur the warthog, who cannot be bothered to stop grazing on yummy grass, even for a photo opportunity. Mount Kenya wildlife orphanage, Nanyuki.



Waterbuck are shaggy, handsome ungulates, almost reminiscent of elk. They are rare at Mpala but are fairly common in montane, forested, and swampy areas. Aberdare National Park.

Ryen Nielsen, Darian Hale, and Ema Lujan in the home of a Maasai woman, who wonders why the young ‘uns these days are always staring at their phones. Il Motiok Community.

Mukenya surprise. George Opiyo, Zoe Short, and Devin Gearhart admire the Laikipia landscape beneath an overhang, while Jesse Alston and Isaac the askari philosophize the afternoon away.

(left) An aardwolf peers warily from its underground lair. Aardwolf is Afrikaans for ‘earth wolf’, which is a misnomer; this elusive species is a hyena that feeds almost entirely on termites.

Our class had tremendous luck seeing large (>10kg) carnivores. Over our time in Kenya, we saw:
-- >20 spotted hyenas
-- 13 African wild dogs
-- 6-8 striped hyenas
-- 5-6 leopards
-- 4 lions
-- 2-3 aardwolves
-- 1 cheetah

A rare sighting of the aardicus, tunneling down an aardvark burrow to evade predators.

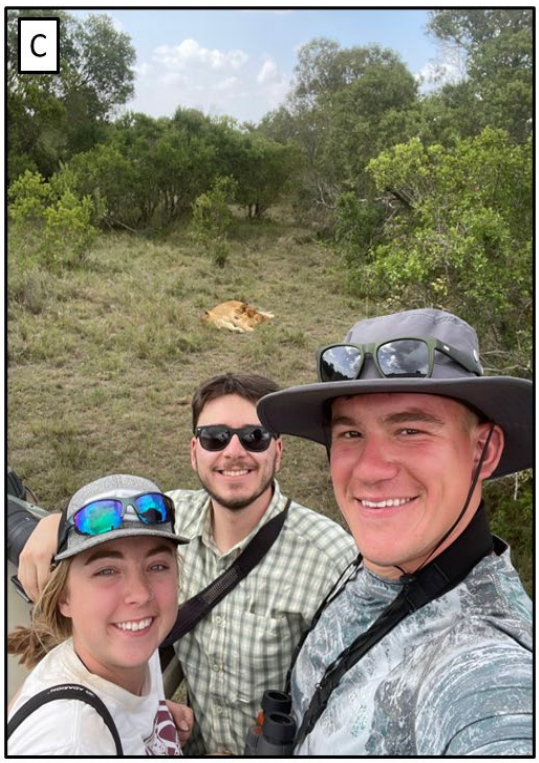
With laser-sharp focus, Dylan Scherer photographs a a spotted hyena. Aberdare National Park.

Bat-eared fox are yet another insectivorous carnivore. They are unusual among dogs in having litters of a few relatively large pups (as opposed to litters of many small pups). The individual in the background is a pup; the one in the foreground likely is its mom.

(left) As might be expected, students from Kenya and the U.S. have different values, experiences, motivations, and perceptions. We hope (and believe) that mutualisms sprouted from cross-cultural exchanges in our course.

(above) Sometimes, we even looked at insects, like this walking stick.

A young river hippo grazes placidly on the banks of the Ewaso Ng'iro. It often is said that hippos kill more people in Africa than any other mammal. We are skeptical of this assertion, although an agitated hippo is a menace, no doubt.



Three observations about mammals. (A) Mamas in Class Mammalia are inclined to communicate to their kids “I love you, but I don’t love your actions”. (B) Kids in Class Mammalia universally know they are cute, so requests for forgiveness are rarely denied. (C) There are interesting tensions in how *Homo sapiens*, collectively, feels about the other ~6500 species of mammals, especially the big fierce ones. They are beautiful, and they inspire happiness and awe (per the smiles of Darian Hale, Devin Gearhart, and Atticus Klass). They remind us that there are still a few wild places left on Earth. We use them as mascots and totems, and to advertise and market things that we want to sell, typically without asking their permission or even saying thank you. We pay to watch shows and movies about them, and to see them in national parks and in zoos. They are the subjects of our art, our stories, and our mythologies. When they occur far away from us, we love them, or at least tolerate them. Yet, when they kill and eat the things that we want to kill and eat, or the things that the things we kill and eat want to kill and eat, we do not want to share. So, we resent and fear them. We build farms, subdivisions, ranchettes, parking garages, and strip malls where they live, again without asking their permission. Then, we get frustrated when they don’t accommodate us. We justify our actions by stating that a balance must be struck between people and wildlife (please see below). Ol Pejeta Conservancy.

(right) Senegal galagos (commonly called bush-babies) are small, nocturnal primates common throughout eastern and southern Africa. Several resided in our campsite. They are arboreal, often using our tents as springboards when moving from tree to tree. Along with lemurs, pottos, and lorises, they are known as “prosimians”, more primitive counterparts to humans, other apes, and monkeys.

Savanna elephants are the largest extant land mammal; the gal on the right probably weighs around four tons. Sub-Saharan Africa is the only place on Earth where megaherbivores (mammals >1000 kg) are still relatively common. As such, it gives us a glimpse as to what things might have been like 15,000 years ago in North America.

(left) Atticus Klass, Mike Pieper, and students from a nearby primary school regard each other warily from a distance. Of endless fascination to Kenyan kids are the hair textures, skin colors, profuse sweating, and large morphologies of our Wyoming students. Eventually, trepidation gives way to curiosity, then happiness. Before long, good clean fun is had by all with Turkana dances. Muthira community.

(above) Celine Wandia and Kellyn Chandler jump and levitate for joy, respectively.

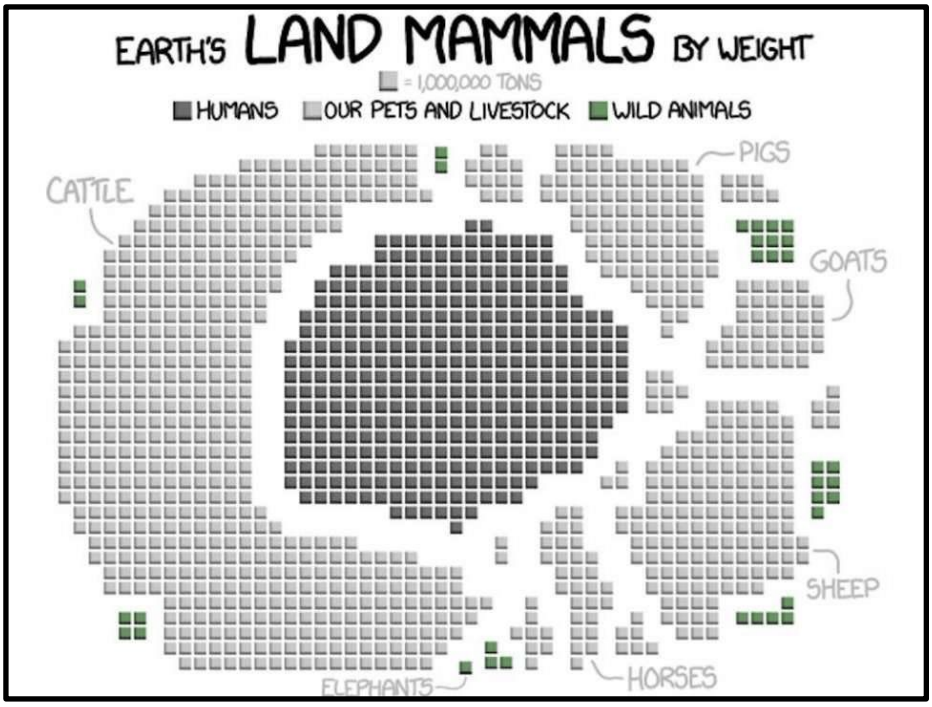
Ryen Nielsen, Sophie Culver, Ema Lujan, Zoe Short, Kellyn Chandler, and Angela Zhu are indicating to the photographer that there is a (tame) black rhino, slumbering about a foot away from them. An askari gets a chuckle out of their behavior. Laikipia houses some of the world's highest densities of black rhinos. Rhinos are poached for their horns, mistakenly regarded as aphrodisiacs in the traditional medicines of some cultures. However, folks from these cultures might be better off simply grinding up and eating fingernail clippings, as both rhino horn and fingernails are made of the same stuff (keratin). That, or they could just ask their doctors if Viagra is right for them. Ol Pejeta Conservancy.

Not many folks have been in a hailstorm in East Africa, on the equator, and have lived to tell the tale. (A) We began hiking Ol Donyo Lesatima (Maasai for Mountain of the Male Calf) around 9am on a clear, warm day. (B) At just over 4000 meters, this peak is the third highest in Kenya, and it was a slog to get to the top. (C) Within minutes of summitting, the hail and snow came down in biblical force. (D) But this did nothing to diminish the can-do attitudes of Celine Wandia, Kellyn Chandler, and Ryen Neilsen (clockwise from bottom left). Aberdare National Park.

A central part of our course was walk n' talks, interactive lectures blended with hands-on activities. Here, students learn how ant mutualists, soil fertility, and browsing by elephants create the monoculture of whistling-thorn acacia in the background of this photo.

(clockwise from bottom left) Leo Khasoha, Atticus Klass, Samuel Wicks, Gilbert Busienei, Peter Lokeny, and Sophie Culver learn how to trap and handle small mammals (in this case, a fringe-tailed gerbil).

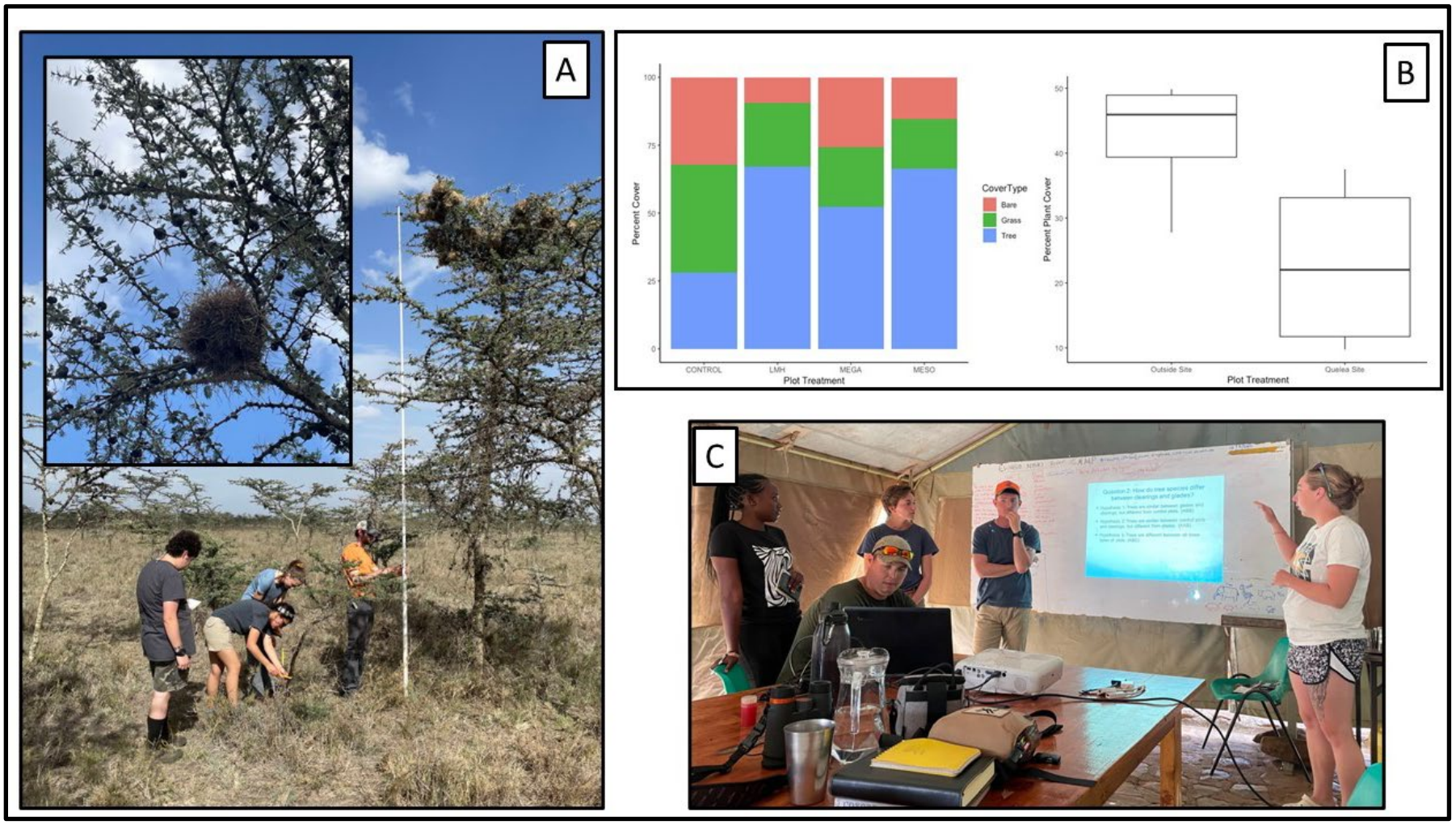
This cheetah is only the fourth that the main teacher has seen in 20 years of working on Mpala Conservancy, and the first ever seen with a class. Cheetahs are listed as 'Vulnerable' by the International Union for the Conservation of Nature, and 'Endangered' by the U.S. Endangered Species Act. There are 6000-8000 left in the wild. For comparison, this is ~10% of the number of mountain lions believed to be in the wild, and ~0.0016% (or roughly 1/5th of 1% of house cats on Earth). A small silver lining: this individual was pregnant.



(left) The World Needs More Wild Mammals™. Across the globe, the collective weight of humans, their livestock, and their pets (a total of 10-15 mammalian species) is >10 times more than the remaining ~6490 species of mammals combined. Frequently, it is stated (1) that there needs to be a balance between the interests of humans, and those of nature; and (2) that diversity is really important.

Many in our class were inclined to agree with these statements, particularly in light of the data illustrated here.

Source:
"Harvesting the biosphere". Smil, V. 2011.



The scientific process involves making observations about nature, turning those observations into numbers, and telling an audience why those observations are interesting, important, or (sometimes, with luck) both. Our course consisted of three groups, each of which conducted scientific work on an aspect of savanna ecology. (A) Team Starling demonstrated that songbirds—mainly white-browed sparrow weavers and superb starlings—preferred to nest in whistling-thorn trees occupied by *Crematogaster nigriceps*, an ant symbiont that castrates its host trees. (B) Team Quelea showed that red-billed quelea birds selected "LMH" plots (1-ha plots from which large mammalian herbivores had been experimentally excluded with electrified fencing) to roost; even five years after roosting, the plant communities beneath such roosts were altered compared to control (non-roost) areas. (C) Team Glade discovered that experimentally removing trees was not enough to attract impala (a deer-sized antelope) to cleared plots. Cattle corrals were needed in combination with tree removal to attract impala: the former increases forage quality and the latter decreases risk of being killed by leopards and wild dogs.

A typical morning scene at the Ewaso Ng’iro campsite at Mpala Conservancy.

2022 UW Field Course in the Ecology & Conservation of African Savannas. Front row: Jesse Alston, Darian Hale, Ema Lujan, Kellyn Chandler, Celine Wandia, Angela Zhu, Ryen Nielsen, Sophie Culver, Dylan Scherer. Back row: Jake Goheen, Atticus Klass, Samuel Wicks, Mike Pieper, Zoe Short, George Opiyo, Devin Gearhart. Aberdare National Park.