THE SCHOOL FOR FIELD STUDIES

Wildlife Ecology
SFS 3720

4 credits

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

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

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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 present. In other words, the elephants are not always where we want them to be, so be flexible!

Course Overview

The overarching goal of the Wildlife Ecology course is to provide students with background on the ecological concepts and principles of East Africa's Savanna Ecosystems. The course will cultivate interest in and develop an understanding of the wildlife ecology and conservation of the African large mammals, insects, vegetation, and other natural resources found in the Maasai Steppe of Tanzania. Students will have a chance to learn and apply in the field multiple techniques and approaches to assess and monitor different species of wildlife. Besides, students will learn various ecological sampling techniques, including making observations in the field and inferring wildlife behavioral, ecological, and biological attributes. Students will apply and demonstrate wildlife ecological concepts, principles, theories, and techniques for enhanced and sustainable management of wildlife, plant, and other non-biological resources. Aspects learned by students in this course will also be applied to meet the needs and objectives of the Directed Research component of the program.

Learning Objectives

Through interactive learning and experiential activities, including lectures, field exercises, class discussions, and field lectures, this course exposes students to the following concepts and skills: -

1. Ecological concepts, theories, and principles of savanna ecosystems of East Africa.
2. Strategies and options to help mitigate several drivers of ecosystem change and natural resources degradation in the Tarangire-Manyara Ecosystem.
3. Techniques and approaches to studying wildlife ecology, natural resources, and ecosystems.

Case Study Overview and Background

Overview

The grasslands of northeastern Tanzania (Maasai Steppes) comprise extensive areas of land, which is home to the Maasai community. The landscape has been used traditionally by the Maasai pastoral community to graze livestock on a communal basis, but this practice has rapidly changed in the last decades. There has been a steady shift in the land-use pattern from purely pastoral to mixed agro-pastoral systems driven by multiple factors, including changing demographics, emerging economic opportunities, increasing tourism demands, and access to markets. Land-use changes in the wildlife dispersal areas/wildlife corridors connecting adjacent protected areas compromise the ecological and environmental integrity and quality, a situation that threatens the survival of many species, especially large mammals like the African elephants. In general, the situation constrains biodiversity conservation efforts and generates antagonism between the dual goals of local livelihoods and conservation.

Issues influencing and affecting wildlife conservation, local livelihoods, and human-wildlife co-existence in the Maasai Steppe of Tanzania present opportunities for both, students and SFS faculty to explore the best strategy for promoting wildlife conservation whilst improving local communities' livelihoods. We will use multiple learning approaches, including researching specific issues that have a bearing on the drivers of changes in these biodiversity-rich landscapes, and their impacts on local livelihoods, wildlife, and other critical natural resources. The SFS-CWMS program is geared towards preparing students to answer the following case study question:

How can changes in land use and resources available in the Maasai Steppes of Tanzania be managed to foster the well-being of local communities whilst safeguarding and promoting biodiversity conservation?

Background

The Tarangire-Manyara Ecosystem (TME) is one of the key wildlife-rich areas in Tanzania and part of the Northern tourist circuit that includes famous protected areas like Ngorongoro Conservation Area and

Serengeti, Lake Manyara, Tarangire, Arusha, and Mt. Kilimanjaro National Parks. TIME covers approximately 35,000 km^2. Tarangire and Manyara national parks managed by Tanzania National Parks (TANAPA) are the core protected areas in the TME exclusively designated for non-consumptive wildlife utilization (photographic tourism). Other forms of protected areas in the TME include Wildlife Management Areas (WMAs) managed by local communities for tourism investment, Game Control Areas (GCAs), and Game Reserves (GRs) managed by Tanzania Wildlife Management Authority (TAWA) largely for consumptive wildlife utilization, especially trophy hunting. Consumptive utilization of wildlife (Trophy Hunting, Resident Hunting, and Game Capture) is also allowed in Open Areas (OAs) with wildlife that falls under the village lands designated as hunting blocks. All protected areas in TME have porous boundaries that allow wildlife to migrate freely between protected areas and dispersal areas or wildlife corridors in community/village land. This situation promotes high levels of human-wildlife interactions and subsequently human-wildlife conflicts. For many decades, the primary inhabitants of TME have been pastoralist Maasai communities with low human population density. However, over the past three decades, there has been a rapid increase in the human population mainly due to immigration with consequent changes in land use leading to the expansion of agriculture and human settlement. This has resulted in the blockage of migratory wildlife routes (such as into Simanjiro plains and to Lake Manyara through Kwakuchinja Wildlife Corridor) and habitat fragmentation and has created more opportunities for human-wildlife conflicts.

TME is faced with multiple threats ranging from land-use changes, tourism proliferation, human population increase, and general ecological changes. The parks are renowned for their biodiversity in a relatively dry landscape, but their future is in jeopardy due to insularization. There are growing land-use changes, such as large-scale farming, unplanned settlements, and an increase in human population in the dispersal areas, migratory routes, and wildlife corridors, which are necessary for the free movement of large mammalian species and the exchange of genetic materials. Moreover, uncontrolled tourist activities and accommodations (such as campsites and curio shops) around the parks create more insularization of the parks. Uncontrolled hunting of wildlife in the dispersal and game control areas outside the parks is prevalent, hence endangering critical wildlife species. Human-wildlife conflict is equally rampant, further compromising the future of wildlife conservation, local livelihoods, and harmonious human-wildlife co-existence.

Other challenges in the TME include rampant poaching of wildlife due to inadequate law enforcement, an increase in the human population, and unplanned development of tourist accommodation facilities (such as campsites and lodges) around the parks. Although tourism benefits local communities, it exerts a high-water demand, reducing the quantity of water discharge into lake Manyara, and reducing water quality due to potential pollution from sewerage and domestic effluents. Poorly regulated hunting of wildlife in dispersal and game control areas outside the parks threaten populations of critical wildlife species. Expanding irrigation in nearby rice farms in Mto wa Mbu town, heavy siltation, excessive pesticide application, pollution, and depletion of vegetation due to farming in the highland catchment areas affect the ecology and biodiversity of Lake Manyara and the adjacent wetlands. This is compounded by an increase in the human population in the catchment areas. The groundwater in Mto wa Mbu is close to the surface and therefore increasing population, unplanned settlement, and pollution which arise from overflowing pit latrines further pollute Lake Manyara. This semester will provide a series of lectures and carefully designed research projects implemented by the students to explore these conservation issues in the TME through a multidisciplinary approach. Student projects will focus on providing baseline assessments, critical analysis, and investigation to provide information to contribute towards sustainable environment and natural resources management, promote wildlife conservation and improve local communities' livelihoods.

Assessment

The evaluation breakdown for the course is as follows:

Assessment Item	Value (%)
Primates Behavior: Short Communication	15
Midterm Exam	20
Ecological Monitoring Technique: Home Range and Territoriality	25
Participation	10
Final Exam	30
TOTAL	**100**

Primates Behavior: Short Communication (15%)

Students will learn and practice behavioral observation techniques to observe and record baboons' behaviors, time budgets, activity patterns, and how they interact with each other and with their natural environment. Students will construct ethograms and develop a short 2,000-word communication article.

Midterm Exam (20%)

There will be a two-hour written midterm. The test will be based on materials covered from case studies, readings, class, guest, and field lectures, discussions, videos, field exercises and observations.

Ecological Monitoring Technique: Home Range and Territoriality (25%)

This is a lab session in which students will use long-term data collected by the Tarangire Lion Research Project from the lion population in the TME. Students will also have the opportunity to acquire hands-on experience on how to use QGIS in constructing home ranges/territories, determining their sizes, and relating territory sizes to territory qualities. From the collected data, students will construct, analyze, visualize, present, and discuss findings of the lion home ranges/territories in the TME through a short 2,000-word communication article.

Participation (10%)

This assessment strategy seeks to encourage students to actively participate in class discussion, and to motivate students to do background reading and preparation for a class session. Active participation will encompass active learning in class, lab, field exercises, during expeditions, and group work.

Final Exam (30%)

At the end of the semester, you will have a two-hour written exam. The exam will be based on materials covered from case studies, readings, class, guest, and field lectures, discussions, videos, field exercises and observations.

Grading Scheme

A	95.00 - 100.00%	B+	86.00 - 89.99%	C+	76.00 - 79.99%	D	60.00 - 69.99%
A-	90.00 - 94.99%	B	83.00 - 85.99%	C	73.00 - 75.99%	F	0.00 - 59.99%
		B-	80.00 - 82.99%	C-	70.00 - 72.99%		

General Reminders

Honor Code/Plagiarism – SFS places high expectations on their students and we hold students accountable for their behaviors. SFS students are held to the honor code below. SFS has a zero-tolerance policy towards student cheating, plagiarism, data falsification, and any other form of dishonest academic and/or research practice or behavior. Using the ideas or material of others without giving due credit is cheating and will not be tolerated. Any SFS student found to have engaged in or facilitated academic and/or research dishonesty will receive no credit (0%) for that activity.

> *"SFS does not tolerate cheating or plagiarism in any form. While participating in an SFS program, students are expected to refrain from cheating, plagiarism and any other behavior which would result in a student receiving credit for work which they did not accomplish on their own. Students are expected to report any instance of cheating or plagiarism by others."*

Deadlines – Deadlines for written and oral assignments are instated to promote equity among students and to allow faculty ample time to review and return assignments before others are due. As such, deadlines are firm; extensions will only be considered under extreme circumstances. Late assignments will incur a penalty of 10% of your grade for each day you are late. After two days past the deadline, assignments will no longer be accepted. Assignments will be handed back to students after a one-week grading period. Grade corrections for any assessment item should be requested in writing at least 24 hours after assignments are returned. No corrections will be considered afterwards.

Content Statement – Every student comes to SFS with unique life experiences, which contribute to the way various information is processed. Some of the content in this course may be intellectually or emotionally challenging but has been intentionally selected to achieve certain learning goals and/or showcase the complexity of many modern issues. If you anticipate a challenge engaging with a certain topic or find that you are struggling with certain discussions, we encourage you to talk about it with faculty, friends, family, the HWM, or access available mental health resources.

Participation – Since we offer a program that is likely more intensive than you might be used to at your home institution, 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 course is mandatory, it is important that you are prompt for all activities, bring the necessary equipment for field exercises and class activities, and simply get involved.

Course Content

Type- **L:** Lecture, **FL:** Field lecture, **FEX:** Field Exercise, **GL:** Guest lecture, **CD:** Class Discussion

No	*Title and outline*	*Type*	*Time (hrs)*	*Required Readings*
1	**Case study introduction** In this topic, students will be exposed to various issues contributing to the current state of conservation in the Tarangire Manyara Ecosystem.	L	1.0	
2	**Traveling Lecture: Applied landscape ecology.** Identify key drivers (direct and indirect) of ecosystem dynamics and ecological relationships in the TME.	TL	1.0	Clark, W. (2010). Vitousek, et al. (1997).

No	Title and outline	Type	Time (hrs)	Required Readings
3	**Vegetation Classification and Associations** Students will learn the main types of African vegetation and associated species of mammals (medium and large) and Birds.	L; FEX	2.0	Abie, K., et al. (2021).
4	**Vegetation Assessment Techniques** Students will identify and describe common vegetation types and associated key wildlife species, learn, and apply various vegetation sampling techniques used for estimating plant abundance and species diversity.	L; FEX	3.0	Elzinga, C.L., et al. (1998). **Field Guide:** Dharani (2019).
5	**Wildlife Adaptations** Learn and describe key adaptation features (morphological, behavioral, and physiological) that enable various wildlife species to enhance their survival in a particular habitat and ecosystem.	L; FEX	2.0	Rosalino, et al. (2009) **Field Guides:** Estes, R. D. (1991). Kingdon, J. (1997).
6	**Field Ornithology: Theory** Students will learn how to classify, identify, and describe distinguishing characteristics of birds, and determine their age and sex using direct and indirect techniques. Besides, they will prepare bird checklists as part of the fieldwork.	L	2.0	Sekercioglu, et al. (2004). Tiwari, et al. (2021).
7	**Field Ornithology: Greater and Lesser Flamingo Conservation** This field exercise will be undertaken in the Tarangire Manyara Ecosystem. In the Manyara Ranch, students will sample birds using Mist Net and Point Count Methods. Besides, students will visit Lake Burunge, identify, and discuss factors underlying the decline of Flamingos in the Tarangire-Manyara Ecosystem.	FEX	4.0	**Field Guide:** Dale A. Z, Donald A. T, and David J. P. (1996).
8	**Ecological Monitoring Techniques: Theory** This lecture covers various techniques used for short-term and long-term population monitoring of various animal taxa including insects, birds, large and small mammals. The lecture will highlight and demonstrate how direct, indirect, passive and active sampling techniques including Radio Telemetry, Sherman traps, Pitfalls traps, Pan Traps, Malaise Traps, Sweep Nets, Mist Nets, Butterfly Trap, animals signs and indices work in ecological studies.	L; FEX	4.0	Montgomery, et al. (2021). McCravy, K. (2018).
9	**Ecological Monitoring Techniques: Radio Telemetry** This course will involve lectures, field demonstrations, and lab sessions where students will learn how to analyze and visualize the already collected radio telemetry data in addition to making ecological and conservation-related conclusions.	L; FEX	4.0	Harris, S., et al. (1990).

No	Title and outline	Type	Time (hrs)	Required Readings
10	**Ecology and Conservation of Apex Predators (Lion and Hyaena)** Students will gain an understanding of the Lion ecology in the Serengeti Ecosystem with a focus on Pride behavior, dynamics, and recent population trends in the ecosystem. In addition to reading scientific articles, researchers will provide on Lion ecology and the conservation challenges they face.	L	3.0	Kissui, B. M. & Packer, C. (2004). Hanby, J.P., et al. (1995).
11	**The ecology of large herbivorous mammals and their digestive systems** This lecture will help the student learn how a diverse range of large mammals' cope with their varying diet. It will entail going through the nutritional ecology of ruminants and non-ruminants focusing on their digestive systems. A ruminant (goat) will be slaughtered and used for the practical.	L; FEX	2.0	Hackmann, T. J., & Spain, J. N. (2010). Chesworth, et al. (1998). Parish, et al. (2017).
12	**Behavioral Ecology I: Primate Behavior (Theory)** Students will be given an overview of the study of primate social structure. Learn key behaviors and various terminologies that are critical for developing primate socialization ethograms. They will learn various techniques that are used in studying primate behavioral ecology. Hear about primate evolution at the Olduvai gorge archeological site.	L	2.0	Swedell, L. (2012). Henazi, S. P. & Barrett, L. (1999).
13	**Behavioral Ecology II: Primate Behavior (Practice)** Students will assess the activity patterns of Olive Baboon in Lake Manyara National Park, collect data, write notes, and develop and present ethograms.	FEX	3.0	Joan B. Silk, et al. (2003).
14	**Ecology and Conservation of Mesopredators (Cheetah, Wild dog, and Leopard)** Students will learn about various mesopredators in the TME and Serengeti ecosystems. Besides, they will develop a broad understanding of ecological aspects (incl. kleptoparasitism) that limit and promote (incl. mesopredator release concept and its cascading effect) population growth. Furthermore, through guest lectures, students will understand various common conservation challenges facing mesopredators in Tanzania and beyond.	L	2.0	Creel & Creel (1996). Dye, C. (1996). Ritchie & Johnson (2009). Prugh, et al. (2009).
15	**Wildebeest ecology** Wildebeest/movement ecology, the cost and benefit of migration, living in groups and wildebeest breeding synchronization.	L	3.0	Estes & East (2009). Tor Torney, et al. (2018). Chapman & Valenta (2015).

No	Title and outline	Type	Time (hrs)	Required Readings
16	**Home Ranges and Territoriality** Students will learn why some species form whereas others don't. Similarly, they will learn how territorial species protect, mark, and advertise territories. Besides, they will learn how to differentiate the territories from home ranges and factors that determine their sizes. Students will discuss some costs and benefits of territorial behavior and ecological/ conservation implications.	L; FEX	4.0	Maher & Lott (2000). Galanti, et al. (2006).
17	**Behavioral Ecology II: African Elephant** Students will learn key ecological aspects (such as feeding behavior, population structure ecological requirements, home range, etc.) that make elephant conservation challenging in an increasingly changing and fragmented world. Students will make close behavior-related observations of elephant clans in Tarangire and Serengeti National Parks. Apply the age and sex-determination skills learned in class.	FEX	4.0	Lohay, et al. (2020). Fritz, H. (2017).
18	**Scientific Writing, Reading, and Presentation Skills** Students will learn skills that will enable them to write publishable scientific articles and technical reports. The course will prepare students for reading efficiently and writing scientific works during the semester. In the course, students will be exposed to common pitfalls for the rejections of articles in scientific journals that may also apply for getting low grades in directed research reports.	L; CD	2.0	Ecarnot, et al. (2015). Subramanyam (2013). Pierson (2004). Pickering (2012). Carey, et al. (2020).
19	**Giraffe Ecology** Ecology of the Masai Giraffe in Tanzania and TME, their ecology, movements, population structure, movements, and sink-source dynamics in TME. Besides, students will have variations in conservation status and drivers of the decline of the four Giraffe species found in Africa.	GL	2.0	Lee & Bolger (2017). Coimbra, et al. (2021).
	Total contact hours		**50**	

Reading List

1. **Abie, K., Tilahun, B., Feyisa, A., Kumssa, T., & Amare, A. (2021).** Diversity and habitat association of medium and large mammals in Gibe Sheleko National Park, Southern Ethiopia. Ecology and Evolution, 11(18), 12251–12258. doi:10.1002/ece3.8000
2. **Carey, M. A., Steiner, K. L., & Petri, W. A. (2020).** Ten simple rules for reading a scientific paper. PLOS Computational Biology, 16(7), e1008032. doi:10.1371/journal.pcbi.1008032 (Optional)
3. **Catherine Pickering (2012).** How to Write Ecology Research Papers

4. **Chapman, C. A., & Valenta, K. (2015).** The costs and benefits of group living are neither simple nor linear. PNAS, 112(48), 14751–14752. doi:10.1073/pnas.1519760112

5. **Chesworth, J. M., Stuchbury, T., & Scaife, J. R. (1998).** Digestion and Absorption in Ruminants and Non-Ruminants. An Introduction to Agricultural Biochemistry, 395–411. doi:10.1007/978-94-009-1441-4_28

6. **Clark, W. (2010).** Principles of Landscape Ecology. Nature Education Knowledge 3(10):34

7. **Coimbra, R. T. F., Winter, S., Kumar, V., Koepfli, K.-P., Gooley, R. M., Dobrynin, P., … Janke, A. (2021).** Whole-genome analysis of giraffes supports four distinct species. Current Biology, 31(13), 2929–2938.e5. doi:10.1016/j.cub.2021.04.033

8. **Colles A, Liow LH, Prinzing A (2009).** Are specialists at risk under environmental change? Neoecological, paleoecological and phylogenetic approaches. Ecol Lett 12:849–863. doi:10.1111/j.1461-0248.2009.01336.x

9. **Creel, S., & Creel, N. M. (1996).** Limitation of African Wild Dogs by Competition with Larger Carnivores. Conservation Biology, 10(2), 526–538. doi:10.1046/j.1523-1739.1996.10020526.x

10. **Dale A. Z, Donald A. T, and David J. P. (1996)**. Birds of Kenya and Northern Tanzania .

11. **Dharani, Najma (2019).** Field Guide to Common Trees & Shrubs of East Africa (Kindle Edition)

12. **Dye, C. (1996).** Serengeti wild dogs: What really happened? Trends in Ecology & Evolution, 11, 188–189. https://doi. org/10.1016/0169-5347(96)30021-9

13. **Ecarnot, F., Seronde, M.-F., Chopard, R., Schiele, F., & Meneveau, N. (2015).** Writing a scientific article: A step-by-step guide for beginners. European Geriatric Medicine, 6(6), 573–579. doi:10.1016/j.eurger.2015.08.005 .

14. **Elzinga, C.L., Salzer, D.W., and Willoughby, J.W. (1998).** Measuring and Monitoring Plant Populations. USDI Bureau of Land Management Technical Reference 1730-1. 492p.

15. **Estes, R. D. (1991).** Behavioral Guide to African Mammals including Hoofed Mammals, Carnivores, and Primates. Awake Forest Stadium Book. Russel Friedman Books Publishers. South Africa. 611pp

16. **Estes, R.D. & East, R (2009).** Status of the wildebeest (Connochaetes taurinus) in the wild 1967-2005. Wildlife Conservation Society 27.

17. **Fritz, H. (2017).** Long-term field studies of elephants: understanding the ecology and conservation of a long-lived ecosystem engineer. Journal of Mammalogy, 98(3), 603–611. doi:10.1093/jmammal/gyx023

18. **Galanti, V., Preatoni, D., Martinoli, A., Wauters, L. A., & Tosi, G. (2006).** Space and habitat use of the African elephant in the Tarangire–Manyara ecosystem, Tanzania: Implications for conservation. Mammalian Biology - Zeitschrift Für Säugetierkunde, 71(2), 99–114. doi:10.1016/j.mambio.2005.10.001

19. **Hackmann, T. J., & Spain, J. N. (2010).** Invited review: Ruminant ecology and evolution: Perspectives useful to ruminant livestock research and production. Journal of Dairy Science, 93(4), 1320–1334. doi:10.3168/jds.2009-2071

20. **Hanby, J.P., Bygott, J.D. & Packer, C. (1995)**. Ecology, Demographics, and behavior of lions in two contrasting habitats: Ngorongoro Crater and the Serengeti Plains. In Serengeti II. Dynamics, Management, and Conservation of an Ecosystem. A.R.E Sinclair & P. Arcese. Editors. University of Chicago Press. USA. pp315-331

21. **Harris, S., Cresswell, W. J., Forde, P. G., Trewhella, W. J., Woollard, T., & Wray, S. (1990).** Home-range analysis using radio-tracking data–a review of problems and techniques particularly as applied to the study of mammals. Mammal Review, 20(2-3), 97–123. doi:10.1111/j.1365-2907.1990.tb00106.x

22. **Henazi, S. P., & Barrett, L. (1999).** The value of grooming to female primates. Primates, 40(1), 47–59. doi:10.1007/bf02557701

23. **Jane A. Parish, J.A., Rivera D., and Boland H. T., (2017).** Understanding the ruminant animal digestive system. Mississippi State University (Optional)

24. **Joan B. Silk et al. (2003).** Social Bonds of Female Baboons Enhance Infant Survival, Science 302, 1231 DOI: 10.1126/science.1088580

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

26. Kissui, B. M., & Packer, C. (2004). Top-down population regulation of a top predator: lions in the Ngorongoro Crater. Proceedings of the Royal Society B: Biological Sciences, 271(1550), 1867–1874. doi:10.1098/rspb.2004.2797

27. **Lee, D. E., & Bolger, D. T. (2017).** Movements and source-sink dynamics of a Masai giraffe metapopulation. Population Ecology, 59(2), 157–168. doi:10.1007/s10144-017-0580-7

28. **Lohay, G. G., Weathers, T. C., Estes, A. B., McGrath, B. C., & Cavener, D. R. (2020).** Genetic connectivity and population structure of African savanna elephants (Loxodonta africana) in Tanzania. Ecology and Evolution, 10(20), 11069–11089. doi:10.1002/ece3.6728

29. **Luís Miguel Rosalino, Luciano M. Verdade and Maria Carolina Lyra-Jorgfile (2014).** Adaptation and Evolution in Changing Environments.

30. **Maher, C. R., & Lott, D. F. (2000).** A Review of Ecological Determinants of Territoriality within Vertebrate Species. The American Midland Naturalist, 143(1), 1–29. doi:10.1674/0003-0031(2000)143[0001:aroedo]2.0.co

31. **McCravy, K. (2018).** A Review of Sampling and Monitoring Methods for Beneficial Arthropods in Agroecosystems. Insects, 9(4), 170. doi:10.3390/insects9040170

32. **Montgomery GA, Belitz MW, Guralnick RP, and Tingley MW (2021).** Standards and Best Practices for Monitoring and Benchmarking Insects. Front. Ecol. Evol. 8:579193. DOI: 10.3389/fevo.2020.579193

33. **Pierson DJ (2004).** The Top 10 Reasons Why Manuscripts Are Not Accepted for Publication. Respir Care; 1246-52. Back to cited text no. 23

34. **Prugh, L. R., Stoner, C. J., Epps, C. W., Bean, W. T., Ripple, W. J., Laliberte, A. S., & Brashares, J. S. (2009).** The Rise of the Mesopredator. BioScience, 59(9), 779–791. doi:10.1525/bio.2009.59.9.9

35. **Ritchie, E. G., & Johnson, C. N. (2009).** Predator interactions, mesopredator release, and biodiversity conservation. Ecology Letters, 12(9), 982–998. doi:10.1111/j.1461-0248.2009.01347.x

36. **Sekercioglu, C. H., Daily, G. C., & Ehrlich, P. R. (2004).** Ecosystem consequences of bird declines. Proceedings of the National Academy of Sciences, 101(52), 18042–18047. doi:10.1073/pnas.0408049101

37. **Subramanyam, RV (2013).** Art of reading a journal article: Methodically and effectively. J Oral Maxillofac Pathol 2013;17:65-70

38. **Swedell, L. (2012).** Primate Sociality and Social Systems. Nature Education Knowledge 3(10):84

39. **Tiwari G, Pandey P, Kaul R, Lee H, Singh R (2021).** Comparison of point and roadside transect methods to evaluate the abundance and richness of diurnal raptors in the arid region of Rajasthan. PLOS ONE 16(12): e0259805. https://doi.org/10.1371/journal.pone.0259805

40. **Tor Torney CJ, Grant C. Hopcraft J, Morrison TA, Couzin ID, Levin SA. (2018).** From single steps to mass migration: the problem of scale in the movement ecology of the Serengeti wildebeest. Phil. Trans. R. Soc. B 373: 20170012. http://dx.doi.org/10.1098/rstb.2017.0012

41. **Vitousek, Peter M., Harold A. Mooney, Jane Lubchenco, and Jerry M. Melillo (1997).** Human Domination of Earth's Ecosystems. Science 277 (5325), 494-499.