

E2: Plant - Animal Interactions for conservation

Instructors : M.Soubadra Devy and Priyadarsanan Dharma Rajan

Semester 2: March to May

Credits: 3

Course description

The course is designed to introduce students to concepts in plant-animal interactions in the context of ecological and evolutionary theory; basic research ; and application of plant-animal interactions to benefit conservation and humans. The course will also increase their ability to interpret and critique primary literature of plant-animal interactions. The field component is particularly designed to hone students' skills in natural history, scientific inquiry, and field research methods.

Classroom sessions

Each of the key topics herbivory, pollination , seed dispersal ,antagonistic and mutualistic interactions will essentially have three sections. The first section will deal with degree of interdependence of plants and animals and also include evolutionary and ecological underpinning (e.g application of phylogeny, community ecology, and conservation biology etc.). In this section, the students will also gain understanding of methods and will have a brief exposure to lab work on pollination, molecular phylogeny and insects identification (in collaboration with Dr. Ravikanth). The will be followed by a series of case studies which will cover all the key topics which enable the students to understand various approaches to test some key hypothesis, and concepts in Plant animal interactions

Field component

About 10 days of field research and interactions is planned in KMTR. The students will design 3 projects which integrates concepts that were introduced in the course. One project will be chosen based on consensus after a brain storming session and this will be carried out in the field. This will be followed by presentation to solicit inputs for analysis and the final research report that will be submitted is expected to be of publishable quality.

ASSIGNMENTS AND GRADING

There will be 3 critiques of scientific papers - 25 %

Discussion papers (minimum of 10) – 25 %

Brief oral presentations (3) -10%

Mini exposure project (1) – 10 %

Group project (1) – 30 %

Session-wise time-table

(Tuesdays – 11:00-11:50am, Thursdays -12:00-12:50pm, Fridays - 12:00-12:50pm)

Date, Day	Topic	Mode of teaching
4th Mar, Tue	1.The importance of plant-animal interaction and its application in conservation, and human benefits	Introductory Lecture
6th Mar, Thu	2.Co-evolution framework of PA-interactions	Summary lecture
	<i>Diffuse co-evolution</i>	discussion of paper
	<i>Correlated evolution</i>	
7th Mar, Fri	3.Generalist Vs. specialist	Discussion of papers
	Tradeoffs of generalist and specialist habits	
11th Mar, Tue	4.Plant-Animal communication	Lecture
13th Mar, Thu	Floral communication and pollination	discussion of paper
	Visual communication in fleshy fruits	
	Evolutionary ecology of non-visual fruits traits	
	The potential of leaf coloration to communicate to animals	
	Chemical communication by plants about herbivores	
15th Mar, Sat (3 hours)	Exercise in the field (Plant-Animal communication) - Lab	Generate hypotheses& design experiments
18th Mar, Tue		Student presentation
	5.Antagonisms	
20th Mar, Thu	a. Plant-insect interactions	Summary lecture
	Defense and counter defense and its role in diversity of plants and insects	
	Patterns of diversification and host plant use - Hybrid bridge hypothesis	
	Optimal defense theory	
21st Mar, Fri	The Janzen Connell hypothesis	Paper discussion
22nd Mar, Sat (3 hours)	Visit to the Entomology Lab (Fig and Fig wasps . Dry Priyadarshan - Lab	
25th Mar, Tue		Student presentation
	vertebrate herbivore	
	Hierarchical foraging	
	Optimal foraging theory	
27th Mar, Thu	Is herbivore all the time bad ? - Conservation of Grassland ecosystems/ nutrient cycling	Discussion of case studies
28th Mar, Fri		Student presentation
	c.Seed predation	
1st Apl, Tue	Seeds as prey and herbivores as predators	Discussion led by T.Ganesh
3rd Apl, Thu	Seed predation and plant dynamics (case study Myristica in KMTR)	Interaction with Chetan M.C

4th Apl, Fri	d. Parasitism as a regulator of plant animal interaction –introduction to inter trophic interactions	Priyan
	Mutualism	
	1. Pollination	
8th Apl, Tue	Ecology and evolution of pollination	Summary lecture
10th Apl, Thu	Linkage pollinator behavior to mating systems of plants	discussion
11th Apl, Fri	Discussion on Bawa hypothesis	discussion
15th Apl, Tue	Application of community Ecology in Pollination (competition, pollination network etc.)	discussion
17th Apl, Thu	Shivanna	lecture Pollination of rare and endangered plants/
18th Apl, Fri		Student topic presentations
19th Apl, Sat (3hours)		Demonstration of pollen tube growth analysis and its linkage pollinator visits
22nd apl, Tue	Pollinator relationships, biogeography and phylogenetic	Paper discussion led by Ravikanth
24th Apl, Thu	Student presentation	
25th Apl, Fri	2.Seed dispersers	Summary lecture
26th apl, Sat (3 hours)	Enabling ecosystem services in a human dominated landscape (in the field)	visit to Anaikal vegetable farms
	Introduction to the concepts	
	Bartering food for movement	
	Population consequences of seed shadow	
	Genetic consequences of seed dispersal	
	Is seed abortion all time bad	
29th Apl, Tue	3.Ant-guard systems	case studies discussion
	<i>Humboltia</i> and <i>Acacia</i> systems	
	4.Combined dynamics of antagonistic and mutualistic interactions	
1st May, Thu	Fig -fig wasp/pitcher plants	case study discussion
	Nectar robbers vis-à-vis pollinators	
	Tritrophic interactions	
2nd May, Fri	Mutualism, coevolution and evolutionary arms race	lecture (Priyan)
	Phylogenies of insect plant interactions	
	Field visit to KMTR	
	Evening discussions in the field*in KMTR	
	Restoration of Plant -Animal interactions along with other assemblages - the sustainable way ?	Lecture
	Grazing Optimization for park management - case of Bustard Sanctuary and Keoladeo national park	Lecture

12th May -26th May (15 days)	Application of Plant -Animal interactions in landscape design	Lecture
	Understanding Plant-Animal interactions to manage invasive (Case of Lantana, and other bio controls)	Lecture
	Group project	
	Exercise in the field (Testing the Janzell Conell model)*	Observations, generate hypotheses, & design experiments
	Exercise related to this in the field in KMTR*	
	The group will design 3 projects which test concepts of their choice and execute it in the field.	
	One project will be chosen based on consensus after a brain storming session.	
	The project design should integrate concepts that were part of the course and the final research reports, which are expected to be of publishable quality.	
	Analysis and report writing will be done through regular contact over the month of June based on the convenience of the instructor and students	