

# Bees and Pollination, Costa Rica, August 2016

## At Universidad Nacional, Heredia, Costa Rica

*Please note, this programme will be updated as new information becomes available, please check latest update*

### Course leaders:

Prof. Dr. Marinus J. Sommeijer, Tropical bees, Coevolution, Stingless bees, Beekeeping development, UU  
MSc. Luis Sanchez, Bee-Plant relations, Flower biology, Pollination in practice, UNA

### Lecturers:

Prof. Dr. Rafael Calderon, Director CINAT, Bee Health, UNA  
Prof. Dr. Johan van Veen, CINAT, Bees and climate, Bumble Bees, Africanized Honeybees, UNA  
Prof. Dr. Ingrid Aguilar, CINAT, Stingless bees, Bee communication, Foraging behaviour, UNA  
Prof. MSc. Henry Arce, Trees and Bees, Tropical Beekeeping, UNA  
Prof. M.Sc. Fernando Ramirez, Africanized Honeybees, UNA  
MSc. G. Zamora, CINAT, Special honey and other medicinal products from Stingless bees, UNA  
MSc. Eduardo Umaña, CINAT, Bee products of native bees, UNA  
MSc. E. Herrera Gonzalez, CINAT, Biodiversity of tropical bees, UNA  
Prof. Dr. Paul E. Hanson, Orchid Bees and Pollination, University of Costa Rica, San José

### Monday 15 August

1200-1800 Key Pick up

18h00 Social meeting with students in town

### Tuesday 16 August

*Daily time schedules are indicative, coffee breaks are not specifically indicated*

930	Welcome and Introductions	Organizing Institutions UNA and UU, Marinus Sommeijer
	Welcome to CINAT	Introduction of the CINAT by CINAT-director Dr. Rafael Calderon A bee research institute in the tropics The objectives of this course Luis Sanchez/Marinus Sommeijer (during coffee)
	Meeting all CINAT staff	
	Meeting the students of the course	
	Practical information	Practical matters for foreign students in Heredia, Luis Sanchez
	Course introduction	Elements & Schedule: lectures, practicals, field trips, team study projects
1030	Lecture: Stingless Bees	Stingless bees, general biology
	Demonstration	Stingless bee colonies kept in CINAT "meliponario"
1130	Lecture: Pollination	Pollination in the tropics. Basics: Biotic pollination, abiotic pollination Syndromes: Bees, Flies and beetles, moths, butterflies, bats, birds Advertisement: Size & shape of tropical flowers re. to bees-syndrome Rewards: the tropical situation
	<b>1230 Lunch</b>	
1330	Lecture: Orchid bees	Orchid bees
	Practical: garden visit and lab	Flower biology: Observations and collecting of flowers Flower analysis with the use of stereoscopic microscope Flower scent: detection of osmospheres. Nectar: analysis of quantity and quality
	Lecture: Flower biology	Pollen and stigma biology: elements of pollination ecology
	Lab/Field	Stigma and pollen germination, pollen collected from foraging bees Testing pollen viability Testing stigma receptivity and pollen germination Melissopalynology: microscopic pollen identification
	Introduction team study projects	Explanation of the team study projects, proposals for topics

### Wednesday 17 August

900 Lecture: Flower constancy	Plant view and insect view.
Practical	Measuring of flower constancy analysis of pollen load tracing a forager's flight path under (semi-) natural conditions
Lecture: Flower characteristics	Natural flowers, artificial flowers conservation in pollination: collecting, surveying, monitoring
Lecture/Field visit: Biodiversity	Insect collecting and preservation (biodiversity), Surveys focusing on foraging bees: sampling methods Recording bees while foraging at flowers (practice protocol) Line transect method (sweep netting to collect pollinators) Bee identification. Bait traps etc.
<b>1230 Lunch</b>	
Lecture: Stingless bees	Diversity, foraging, communication, competition
Demonstration	Foraging behaviour, communication and recruitment
Group discussion	Further explanation team study projects and selection of topics

### Thursday 18 August

900 Lecture: Honeybees in the tropics	Africanized honeybees, beekeeping and bee ecology in tropical America
Lecture: Bee Health	Apis mellifera: bee health and special problems in the tropics
Lab/Garden/Field	Practical honeybee pathology in relation to pollination
<b>1230 Lunch</b>	
Lab/Garden/Field	Team study projects, Students work in small groups
lecture	Stingless bekeeping: Meliponiculture

### Friday 19 August

900 Lecture and video	Bumblebees in the tropics and Orchid Bees as pollinators
Lab/Garden/Field	Practical Pollination biology: using Bumblebees in tomato cultivation Stingless Bees in the greenhouse for pollination of ornamentals
<b>1230 Lunch</b>	
Lab/Garden/Field	Team study projects, Students work in small groups
Lecture:	Diminishing of bee populations world wide, causes and effects.

### Saturday 20 August

All-day field excursion; different possibilities depending on climatic conditions to Bijagua / Cartago - crops at slopes of Irazu volcano; area of Volcano Barva	Stingless bee colonies, and Africanized honeybees Organic coffee farming, silviculture with native trees Tropical fruit cultivations, Flowering trees of importance to bees Comparison of Tropical bees - Honeybees: pollinators of cultivated crops Beautiful tropical landscape, forests, rivers and volcanoes
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### Monday 23 August

Group discussion	Technical discussion and evaluation of Saturday excursion
900 Lecture:	Effects of global warming and climate change on bees
Lectures/demonstrations	Bee products (diversification of products of bees)
	Medicinal products of bees
<b>1230 Lunch</b>	
1330 Lab/Garden/Field	Team study projects, students work in small groups
1630 Group discussion	Explanation and preparation of forest excursion

### Tuesday 24 August

Two-day trip to a station in the tropical rainforest of the Braulio Carillo national park near to the village of Horquetas	On the way, explanation of local flora and fauna Lunch in a typical restaurant Upon arrival explanation of research projects related to bee nests in the forest, Adaptation and Biodiversity Hiking excursion in the forest Other tropical bees and other remarkable (social) insects in the forest
Evening lecture	

### Wednesday 25 August

Lectures, demonstrations	Tropical bees in relation to forest plants: adaptation and biodiversity
Along forest trails and around the station	
Forest trails on horse-back/Visit to the river	Observations on bees in the forest, recording behaviour (e.g. foraging)
Return to Heredia	On the way, further explanation of local flora and fauna

### Thursday 26 August

900 Group discussion	Technical discussion and evaluation of excursion
Lab practical	recap Social Bees
Lab/Garden/Field	Practical Pollination biology
<b>1230 Lunch</b>	
1330 Lab/Garden/Field	Practical Pollination biology
Lab/Garden/Field	Team study projects, students work in small groups

### Friday 27 August

0900-1000 Practicals, Literature Study	Finalization team study projects
Scientific reading and writing	Students prepare reports on team study projects using internet, literature
Writing reports	Preparation of report presentation
<b>1230 Lunch</b>	
1330 Symposium	Minisymposium: presentations by students, outcome team study projects
Wrap up	Certificates and Goodbye