

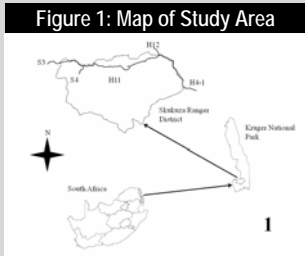
Introduction

In South Africa's Kruger National Park, flowering trees and shrubs form a significant component of the native flora. These plants also provide important browse for large or abundant mammal species, including African elephant (*Loxodonta africana* (Blumenbach)), giraffe (*Giraffa camelopardalis* (L.)), greater kudu (*Tragelaphus strepsiceros* (Pallas)), nyala (*Tragelaphus angasi* (Gray)), and impala (*Aepyceros melampus* (Lichtenstein)). The pollination ecology of many of these tree and shrub species is incompletely known, although accounts have been published for certain species. This poster describes the first phase of our investigations of the pollination ecology of plant species in this savanna landscape. This study has been organized around three main questions:

- What are the diversity and abundance of insect visitors to flowers of trees and shrubs in the savanna study area, measured in terms of number of species and numbers of individuals?
- Of these insect visitors, which appear to be the most important pollinators of the individual plant species?
- What inferences can be made about the pollination systems of these flowering tree and shrub species?

Methods

The area of this study is the Skukuza Ranger District (31.57391 E -25.07859 S), located along the southern bank of the Sabie River in Kruger National Park, Mpumalanga Province, South Africa. Three main linear sampling transects were established for this project (Fig. 1). The total length of these transects is 31 kilometers. An area approximately 30 meters wide was sampled along each transect. Sampling was conducted during two intervals: September 8-15, 2006, in the late dry season, and November 15-December 2, 2007, in the early rainy season. A segment of each transect was driven daily and inspected for flowering trees and shrubs. Insect floral visitors were collected from each flowering tree or shrub. Pollen loads of insect visitors were assessed qualitatively as "heavy" (pollen load conspicuous, often adhering to over half of the body surface, usually in areas of specialized setae), "light" (pollen visible but not dense, usually adhering to less than half of the body surface, usually with considerable areas of integument not covered by pollen), or "absent" (no pollen detected).



Examples of Insect Floral Visitors



Figure 2: Scarab beetle, *Rhabdotis albigrana*, on *Flueggea virosa*
 Figure 3: Scarab beetle, *Dischista cincta*, on *Flueggea virosa*
 Figure 4: Scarab beetle, *Leucocelis amethystina*, on *Acacia nilotica*
 Figure 5: Zygaenid moth, *Arniocera auriguttata*, on *Flueggea virosa*

Results

We sampled 4,280 insects from flowers of 196 trees and shrubs representing 16 flowering plant species from the families Combretaceae, Fabaceae, Ebenaceae, Euphorbiaceae, and Tiliaceae (Combretaceae: *Combretum hereroense* Schinz, *Combretum zeyheri* Sonder; Fabaceae: *Acacia exuvialis* Verdcourt, *A. grandicornuta* Gerstner, *A. nigrescens* Oliver, *A. nilotica* (L.) Willdenow, *A. tortilis* (Forsskal) Hayne, *Cassia abbreviata* Oliver, *Dichrostachys cinerea* Miquel, *Peltiphorum africanum* Sonder; Ebenaceae: *Euclea divonorum* Hiern; Euphorbiaceae: *Flueggea virosa* (Roxburgh) Baillon; Tiliaceae: *Grewia bicolor* Jussieu, *G. flava* De Candolle, *G. flavescens* Jussieu, and *G. monticola* Sonder).

The following table provides summary statistics from this sampling effort.

Plant Species	Number of Plants Sampled	Maximum Visitors Per Plant	Mean Visitors Per Plant	Mean Species Per Plant	Percent Visitors - Blattodea	Percent Visitors - Coleoptera	Percent Visitors - Diptera	Percent Visitors - Hemiptera	Percent Visitors - Hymenoptera	Percent Visitors - Lepidoptera	Percent Visitors - Neuroptera
<i>Acacia exuvialis</i>	60	131	6	2	0	83	1	13	3	0	0
<i>Acacia grandicornuta</i>	2	51	37	10	0	77	0	1	15	7	0
<i>Acacia nigrescens</i>	6	27	11	3	1	46	0	0	46	7	0
<i>Acacia nilotica</i>	33	41	13	5	0	88	3	3	6	0	0
<i>Acacia tortilis</i>	6	23	14	6	0	91	0	1	8	0	0
<i>Cassia abbreviata</i>	4	16	10	4	3	70	0	0	25	0	2
<i>Combretum hereroense</i>	1	21	21	2	0	5	0	0	95	0	0
<i>Combretum zeyheri</i>	2	42	36	5	0	13	0	17	70	0	0
<i>Dichrostachys cinerea</i>	25	8	0.84	0.3	0	71	0	10	19	0	0
<i>Euclea divonorum</i>	1	16	16	4	0	38	0	0	62	0	0
<i>Flueggea virosa</i>	34	376	64	8	0	22	1	0	0	77	0
<i>Grewia bicolor</i>	4	28	16	7	0	80	0	0	11	9	0
<i>Grewia flava</i>	11	39	9	3	0	81	0	5	12	2	0
<i>Grewia flavescens</i>	4	17	13	7	0	55	4	2	39	0	0
<i>Grewia monticola</i>	1	4	4	4	25	75	0	0	0	0	0
<i>Peltiphorum africanum</i>	3	32	23	7	0	97	0	0	3	0	0

Pollinators

Pollen loads (H = heavy, L = light) were observed on the following insect taxa.

Plant Species	Flowering Season	Floral Visitors With Pollen
<i>Acacia exuvialis</i>	Wet	Coleoptera: Scarabaeidae (L); Hymenoptera: Anthophoridae (H), Halictidae (H), Megachilidae (H)
<i>Acacia grandicornuta</i>	Dry, Wet	Coleoptera: Cleridae (L), Meloidae (L); Hymenoptera: Halictidae (H)
<i>Acacia nigrescens</i>	Dry	Coleoptera: Meloidae (L); Hymenoptera: Formicidae (L), Vespidae (L); Lepidoptera: Pieridae (L)
<i>Acacia nilotica</i>	Wet	Coleoptera: Scarabaeidae (L); Hymenoptera: Apidae (H), Megachilidae (H)
<i>Acacia tortilis</i>	Wet	Coleoptera: Cleridae (L); Scarabaeidae (L)
<i>Cassia abbreviata</i>	Dry	Coleoptera: Coccinellidae (L), Meloidae (L)
<i>Combretum hereroense</i>	Dry	Coleoptera: Coccinellidae (L)
<i>Combretum zeyheri</i>	Dry	Coleoptera: Coccinellidae (L)
<i>Dichrostachys cinerea</i>	Wet	Coleoptera: Curculionidae (L)
<i>Euclea divonorum</i>	Dry	Coleoptera: Coccinellidae (L), Phalacridae (L)
<i>Flueggea virosa</i>	Wet	Coleoptera: Scarabaeidae (L); Lepidoptera: Zygaenidae (L)
<i>Grewia bicolor</i>	Wet	Coleoptera: Scarabaeidae (L); Hymenoptera: Apidae (H), Halictidae (H)
<i>Grewia flava</i>	Wet	Coleoptera: Scarabaeidae (L); Hymenoptera: Apidae (H), Halictidae (H)
<i>Grewia flavescens</i>	Wet	Coleoptera: Scarabaeidae (L); Hymenoptera: Anthophoridae (H), Halictidae (H), Megachilidae (H)
<i>Grewia monticola</i>	Wet	pollination not observed
<i>Peltiphorum africanum</i>	Wet	Coleoptera: Scarabaeidae (L)

Conclusions

Most of the plant species sampled in this study are visited (and likely pollinated) by multiple insect species from multiple orders. A majority of the trees and shrubs that we studied have a floral morphology that is suggestive of a generalist pollination system, with numerous small flowers clustered in larger inflorescences and copious pollen and/or nectar rewards. The major exceptions to this pollination system are the shrubs in the genus *Grewia* L. which have single flowers that appear to be predominantly pollinated by social and solitary bees.

Although beetles were the most abundant floral visitors in this study, the lack of pollen loads on many beetles suggests that many beetle species do not play a significant role in the pollination of the tree and shrub species whose flowers they visit. However, certain scarab beetles such as *Dischista cincta*, *Rhabdotis albigrana*, and species of the genus *Leucocelis* appear to transport pollen and probably play at least some role in pollination. Other beetle groups (Cleridae, Melyridae, and Coccinellidae) also appear to transport pollen and may pollinate flowers.

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