# POTENTIAL INVASIVE ALIEN PLANT SPECIES IN SEMULIKI NATIONAL PARK, UGANDA

**Presented by**


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# Introduction

- Alien invasive species (AIS) can be plants or animals which are non native (or alien) to the ecosystem under consideration (CBD, 2004. www.biodiv.org).
- They displace native species (Heutte and Bella, 2003)
- AIS are increasingly recognised as a threat to conservation values (Baskin, 2002)
- Alien invasive species (AIS) may cause economic or environmental harm (Executive Order 1999).
- Over the past few decades, due to rapid increase in forest disturbance and changes in land use (Richardson, 1997).

## Background cont….

### Impacts to ecosystem

- Altered recruitment of native plants
- Increased resource competition (Doria,1998).
- Altered hydrological cycling
- Disturbance altered
- Altered forest structure

## Invasive Alien Plant species in Uganda

- *Eichhornia crassipes* (Mart Solms) water hyacinth on L.Victoria (Famous).

  - *Lantana camara* (L), common in QENP
  - *Acacia hockii* (De Wild), common in L. Mburo NP.
  - *Mimosa pigra* (L),
  - *Chromolaena odorata* (R.M. King and H. Rob),

## IAPS in Uganda cont…

- *Cestrum noctunum* (Larmak),
- *Senna spectabilis* (H.S. Irwin and Berneby) common in Budongo forest and Kibale Forest NP.
- *Striga hermonthica* (Del) Benth., *Striga asiatica* (L.) Kuntze or witch weed which reduces cereal yields,
- *Cymbopogon nardus* (Rendle) that diminishes the productivity of grazing lands.

## IAS in Uganda cont…

- Uganda has been invaded by a new IAPS *Parthenium hysterophoru* (L) (Congress weed).
- entered Uganda through Kenya 4years ago
- 12 districts where detected; Busia, Namutumba, Bugiri, Tororo, Mbale, Jinja, Mbarara, Ibanda, Masaka, Kampala, Kabale and Kasese (International Parthenium news, 2010).

# Alien Plant Species in SNP

**The study selected six (6) APS present in the park**

| Species Name | Family | Common Name |
|---|---|---|
| ***Cedrela odorata*** L. | Meliaceae | American cedar |
| ***Senna spectabilis*** (DC.) H. S. Irwin and R. C. Barneby | Fabaceae Caesalpinioideae | Cassia |
| ***Theobroma cacao*** L. | Sterculiaceae | Cocoa |
| ***Coffea canephora*** Pierre ex A. Froehner | Rubiaceae | Robusta coffee |
| ***Psidium guajava*** (Linnaeus, 1753) | Myrtaceae | Guavas |
| ***Ananas comosus*** (L) Merrill | Bromeliaceae | Pineapples |

# Ecology of selected alien plant species in SNP

- ***Cedrela odorata*** L.

- Native to the Americas.

- Known to be invasive in tropical regions of Africa (including Tanzania), and elsewhere.

# Picture of *C. odorata* plant


A = Seedlings of *C. odorata* and B = big tree of *C. odorata*

## *S. spectabilis* (DC.) H. S. Irwin and R. C. Barneby.

- A native of Tropical America,
- Introduced to Africa as an ornamental plant.
- It is exotic in Eritrea, Ethiopia, Kenya, Malaysia, Puerto Rico, Tanzania, Uganda, United States of America and Zambia.
- Has become invasive in tropical forests in many parts of Africa .

# Picture of *Senna spectabilis*


Look at the flowering effect out side the forest

C = Senna out side the forest D = Senna in side the forest

## ***Theobroma cacao*** L.

- It is a native of America
- *T. cacao* is an understorey plant of wet humid tropic forests.
- It is an exotic species in Uganda and most countries in Africa.

***Coffea canephora,*** Pierre ex A. Froehner

- A native plant in upland forests in Ethiopia; and grows indigenously in Western and Central Africa.

- Native to the highlands of E. Africa, where it occurs in the eastern part of the DRC, Rwanda, Uganda, Kenya and western Tanzania.

***Psidium guajava,*** Guavas (Linnaeus, 1753)

- Native to Central America

- Introduced to tropical and sub-tropical locations around the world for its edible fruit

- It invades disturbed, and to a lesser degree undisturbed sites (CONABIO 2003)

# *Ananas comosus* (Pineapples) (L.) Merrill

- Are known to have originated in South America.
- Pineapple is not found in nature but only found under cultivation (Collins, 1960) and currently within Australia it occurs almost exclusively as a managed fields.
- Invaded natural forest have some kind of human influence through cultivation and abandonment.



# Research problem Statement

- Management of APS (pers comm.) in SNP has not been successful due to the inadequate information and limited attempts available for their management.
- Human disturbances, have aided the spread of APS populations thus impacting indigenous plant populations (pers comm.).
- It is not clear if invasion is ongoing and significant in the intact forest, the disturbed areas of the park or in both.
- No studies have been carried out to ascertain the invasion potential of AP in the park.
- Study carried out to assess which of the APS present in SNP have the potential of becoming invasive and persistent as the forest recovers from disturbance.

# Objectives of the Study

- **General objective**

To assess the invasion potential and status of selected alien plant species in Semuliki National Park.

- **Specific Objectives are;**

I. To determine the abundance/population density of selected alien plant species in Semuliki National Park.

II. To determine the population structure and status of invasion of the selected alien plant species in the park.

III. To determine the distribution pattern of the alien species in relation to environmental factors and disturbance history.

## Significance of the Study

- Contributed information for proper management of IAP in PAs.
- Advise all stake holders on APS control measures
- Provided information management planning
- Contributed information for other researchers
- Guide policymakers on IAS control (quarantine)

# METHODS

## Study area description

- The study was carried out in SNP situated west of Uganda, in Bundibugyo District about 50 km from Fort Portal town.
- It lies on Uganda-Congo border within the northern part of the albertine Rift Valley as shown in Fig.1
- The geographical coordinates are $0^{o}$44'- 00 53' N - 290 57-$30^{o}$ 11'E.
- To the southeast are the Rwenzori Mountains, and to the north Lake Albert.


**Fig: 1 Map showing sampling sites**

Still working on the map using GPS coordinate

## General Study area description cont…

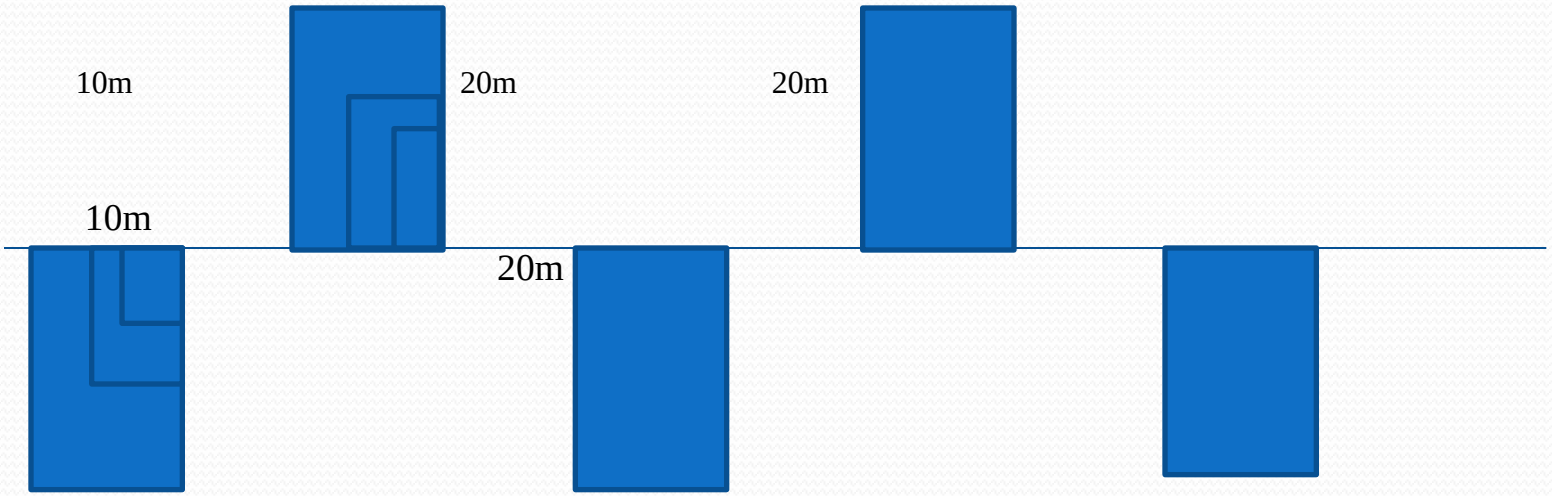
- SNP covers approximately 220 km²
- Was gazetted in October 1993 as a National Park.
- Altitude is 670 -760m asl with flat to gently undulating landform.
- Annual rainfall is 1250 mm with peaks from Mar to May and Sep and Dec. Temp varies from $18^{0}$ C - $30^{0}$ C with relatively small daily variations.
- Vegetation of SNP moist evergreen to semi deciduous forest. The dominant plant species is *Cynometra alexandri*.

## Sampling Sites Description.

- **5** sampling were selected
- **Rwakasenyi site;** Dominant AS was *Senna spectabilis*, also cited at this site to a less extent was *Thivetia peruviana*.
- **Sempaya site;** Dominant AS was *S. spectabilis* and Cocoa.
- **Bumaga site;** Dominant AS was mainly Cocoa and to a less extent coffee (Robusta), *Senna* and *C. odorata*.
- **Ntotoro site;** Dominant AS was mainly Cocoa and Coffee (Robusta).
- **Nsaara:** Dominant AS were mainly Coffee (Robusta) and *C. odorata*. Pineapples were also observed.

## Sampling Design

- In each site three transects at 50m intervals running from secondary into primary forest.
- Quadrants of 20x10m were laid alternately at 20m intervals as in Fig 1. (not to scale)




- In each quadrat, nests of 10x5m, 5x5m and 5x2.5m were used to collect various biological data as determined by the preliminary study/survey for each site.

## Sampling cont…

- **For cocoa and coffee;**

- 20x10m plot, tree stands of >6cm dbh were measured, counted and recorded.
- 10x5m plot, stands of 2-5.9cm dbh were measured, counted and recorded.
- 5x2.5m plot, seedlings were counted and recorded.

- **For *S. spectabilis* and *C. odorata*;**

- In the 20x10m plot, trees of >20cm dbh were measured, counted and recorded.

## Sampling cont…

- In the 10x5m plot, trees of 10-19.9cm dbh were measured, counted and recorded.
- In the 5x5m plot, trees of 5-9.9cm dbh were measured counted and recorded.
- In the 5x2.5m plot, seedlings were counted and recorded.

- In all the study sites the same sampling procedure was applied in both the primary and secondary forest.

- Other environmental variables canopy cover, soil type, soil texture, soil colour, understorey, drainage, topography and forms of disturbance.

# RESULTS AND DISCUSION

## Alien plant species abundance in primary and secondary forests/ha.

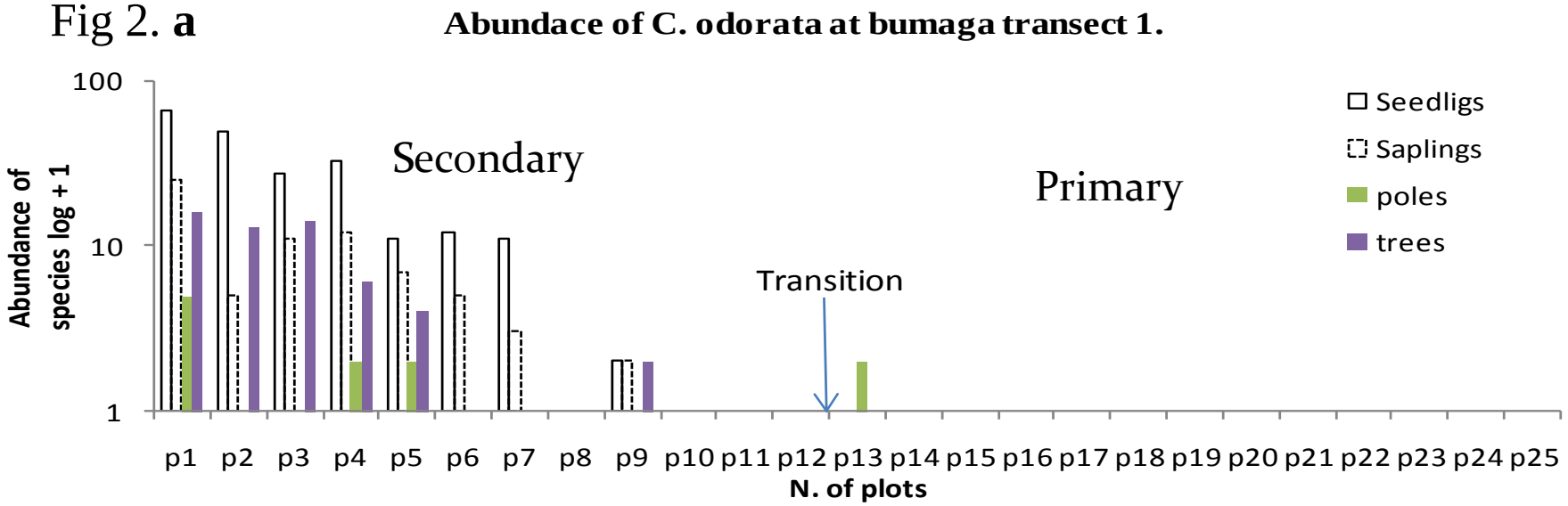
| No. | Common Name | Species | Family | Secondary Forest | Primary Forest | Total in Study area |
|---|---|---|---|---|---|---|
| 1 | American cedar | *Cedrela odorata* L. | Meliaceae | 2137 | 267 | 2404 |
| 2 | Senna species | *Senna spectabilis* (DC.) HS Irwin & Barneby | Caesalpiniaceae | 189 | 24 | 213 |
| 3 | Cocoa | *Theobroma cacao* L. | Sterculiaceae | 2659 | 484 | 3143 |
| 4 | Coffee | *Coffea canephora* Pierre ex A. Froehner | Rubiaceae | 656 | 562 | 1218 |
| 5 | Pineapples | *Ananas comosus* (L.) Merr. | Bromeliaceae | 135 | 84 | 219 |
| 6 | Guavas | *Psidium guajava* L. | Myrtaceae | 2 | 1 | 3 |
| | **TOTAL** | | | **5778** | **1422** | **7200** |

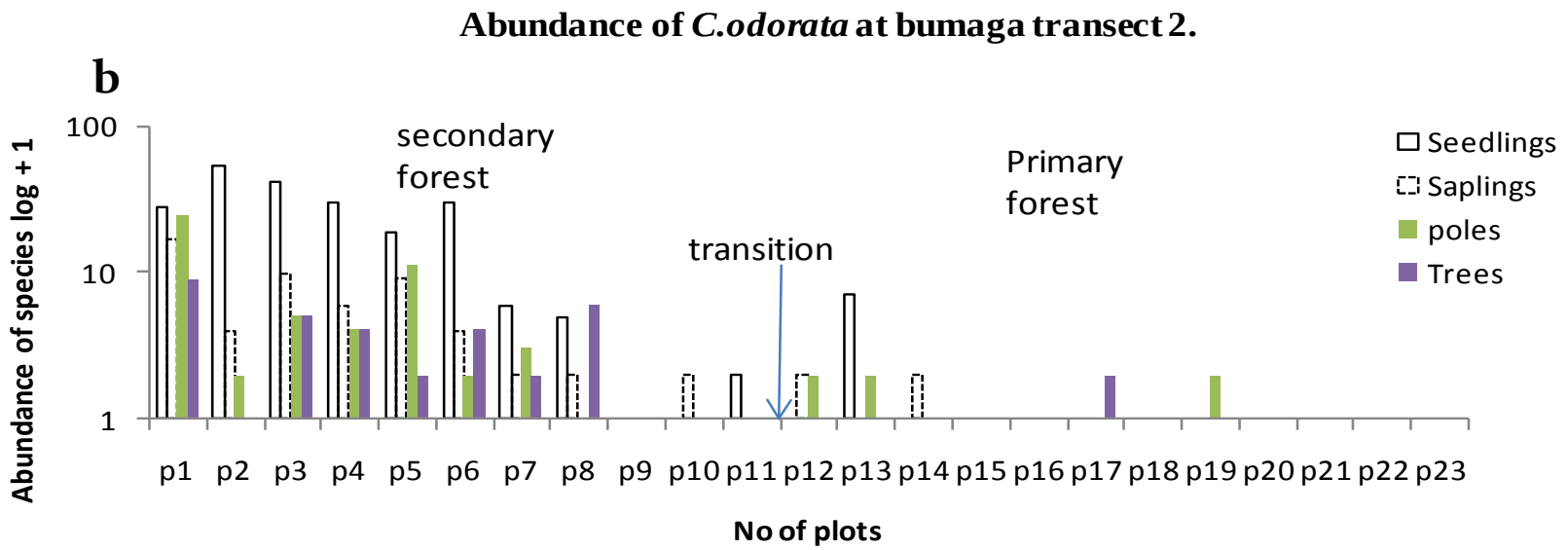
## Results cont…

- Generally the secondary forest had more species abundance than the primary forest. Species *T. cacao* had the highest abundance in the secondary forest, while.
- *C. canephora* had the highest abundance in the primary forest, where as *P. guajava* had the least.
- Findings are in line with a study by (Acharya 1999; Obiri *et al*., 2002), also showed a significant relationship of high APS composition with areas close and accessible to local people.
- Different sites had different species abundances for both the secondary and primary forest Fig 2. *C. odorata* in the secondary forest recorded the highest number of individuals compared to the primary forest.

# Results cont…

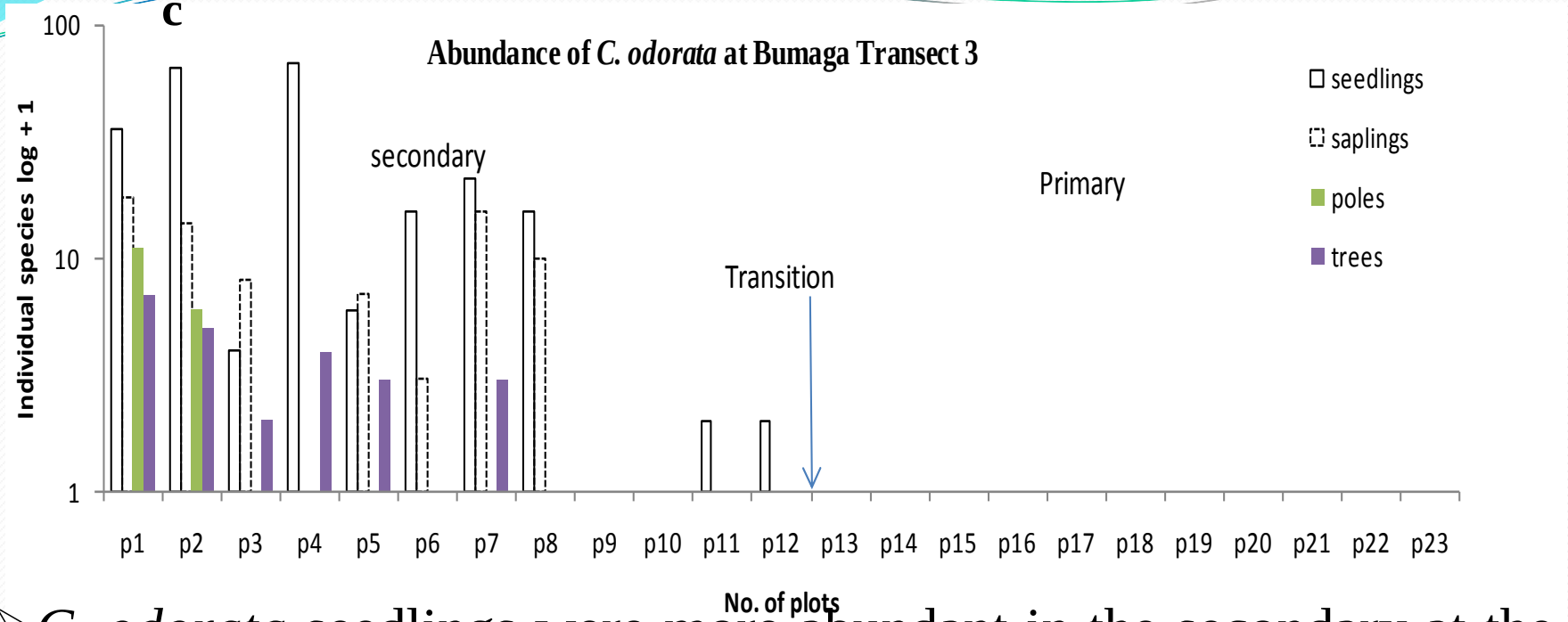
Fig 2. **a**



# results cont…

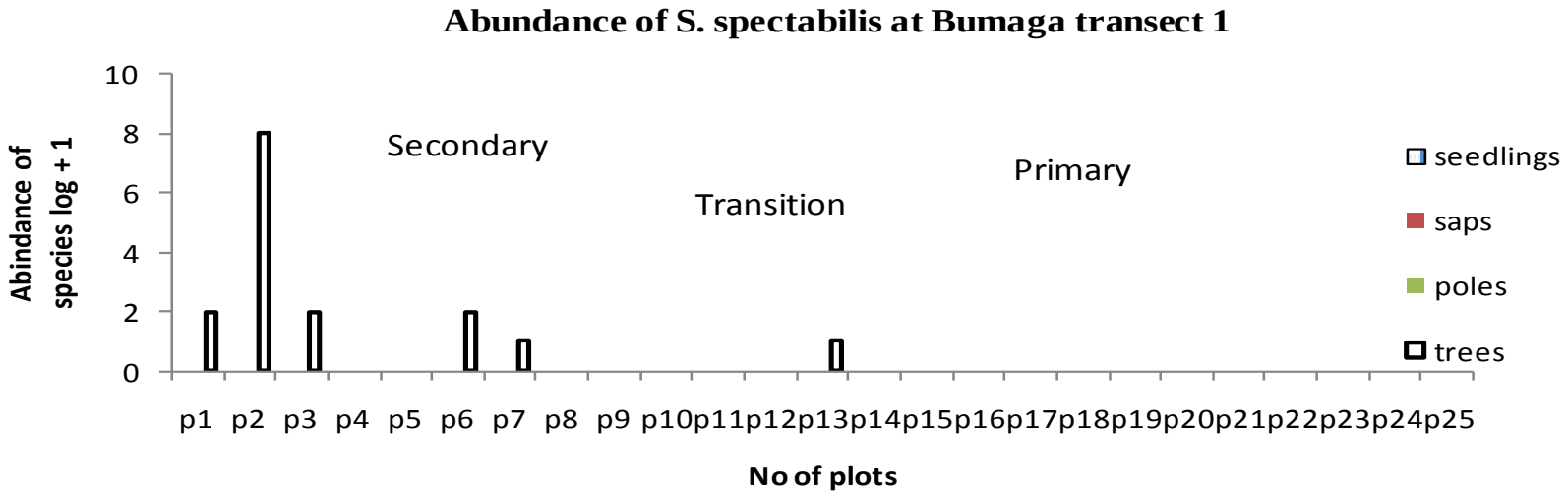
c

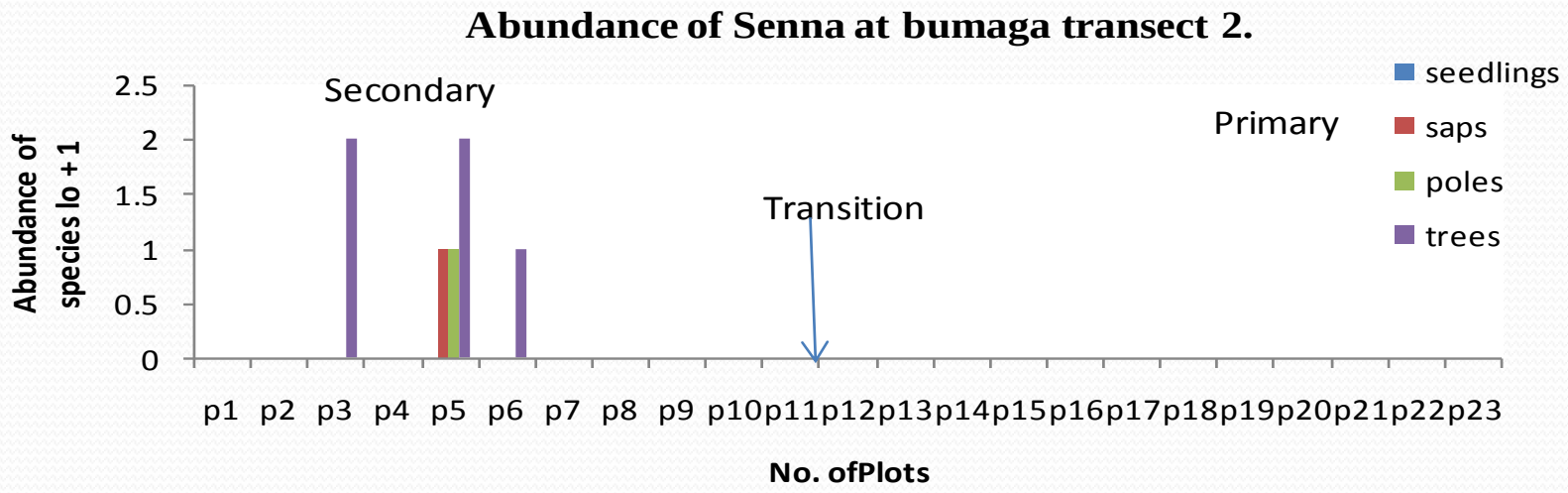



➢*C. odorata* seedlings were more abundant in the secondary at the entire site.

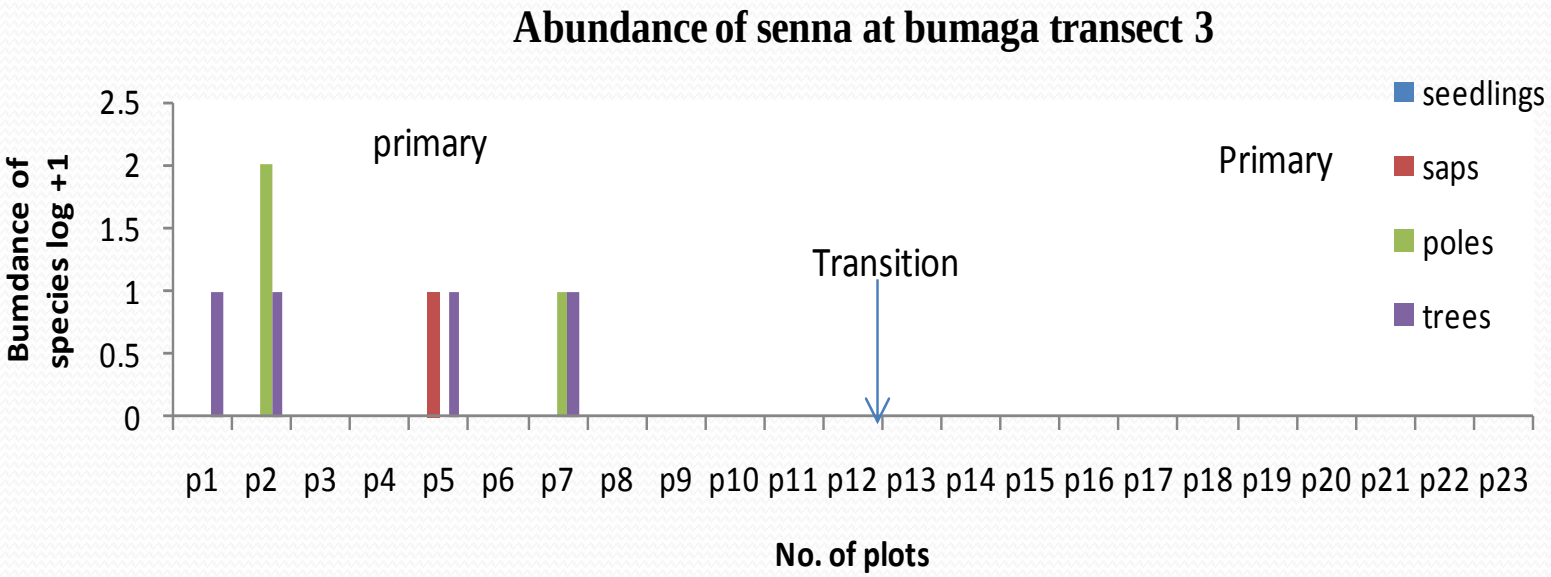
➢This is line with study by (Rejmánek, *et al*., 2005) which showed that disturbed communities are more vulnerable to invasion, while undisturbed areas are less invaded by AP.

# Results cont..



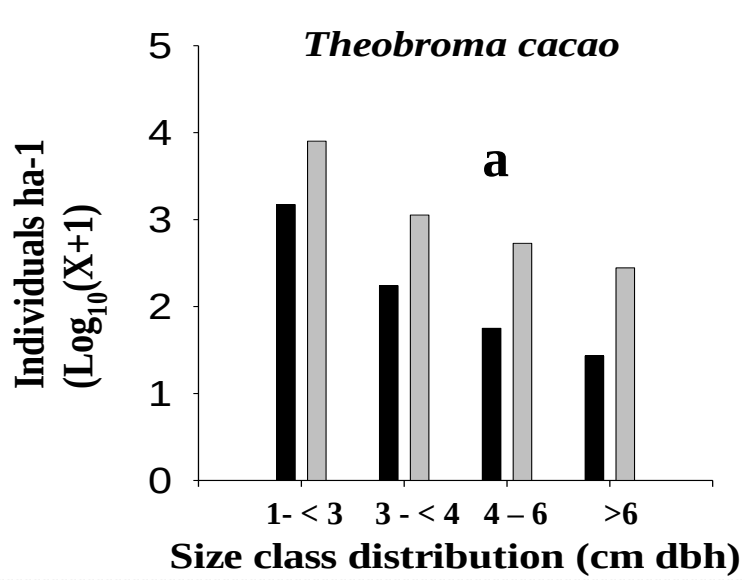
# Results cont…

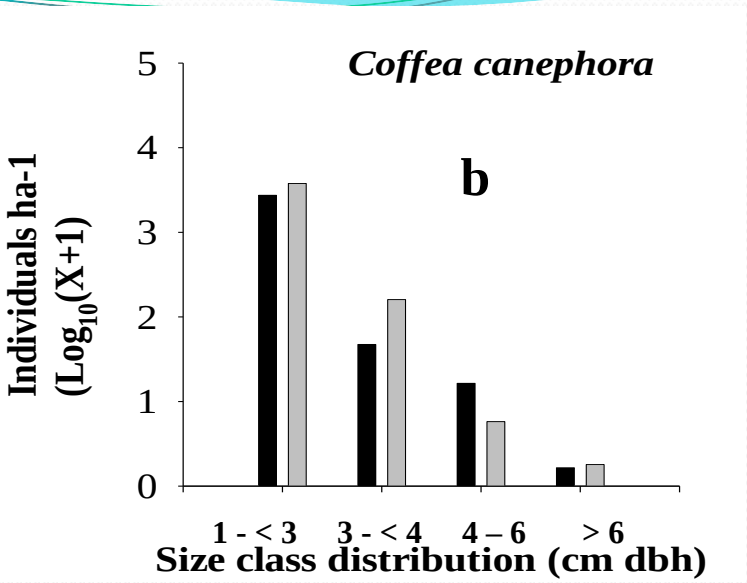


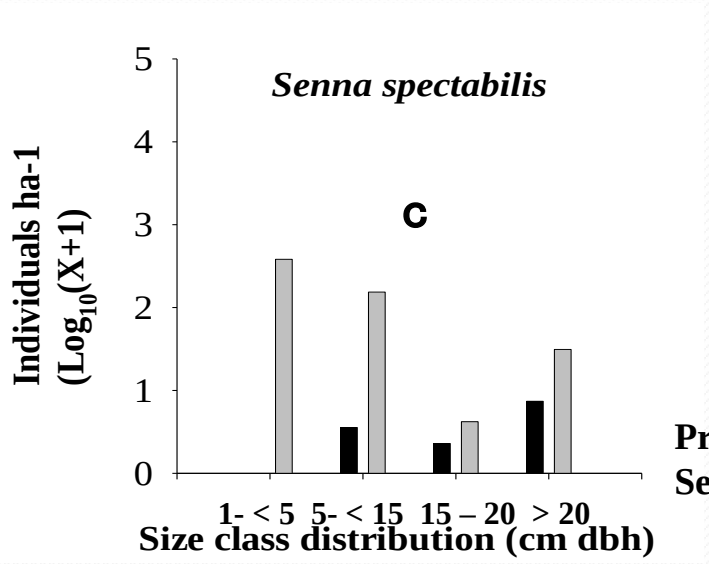

➢ *S. spectabilis trees* were more abundant in the secondary forest at the entire site as compared to the primary.

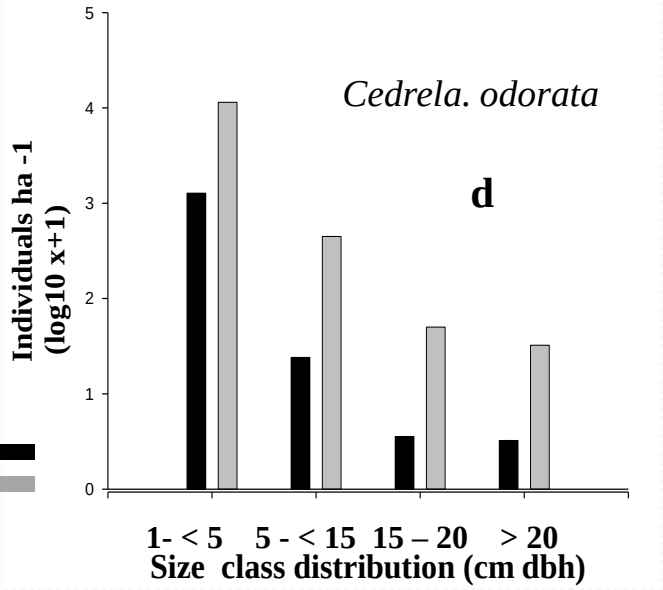
➢This is line with study by (Rejmánek, *et al.*, 2005) which showed that disturbed communities are more vulnerable to invasion, while undisturbed areas are less invaded by AP.

# Population structure of APS in SNP (Fig. 4)




Primary
Secondary

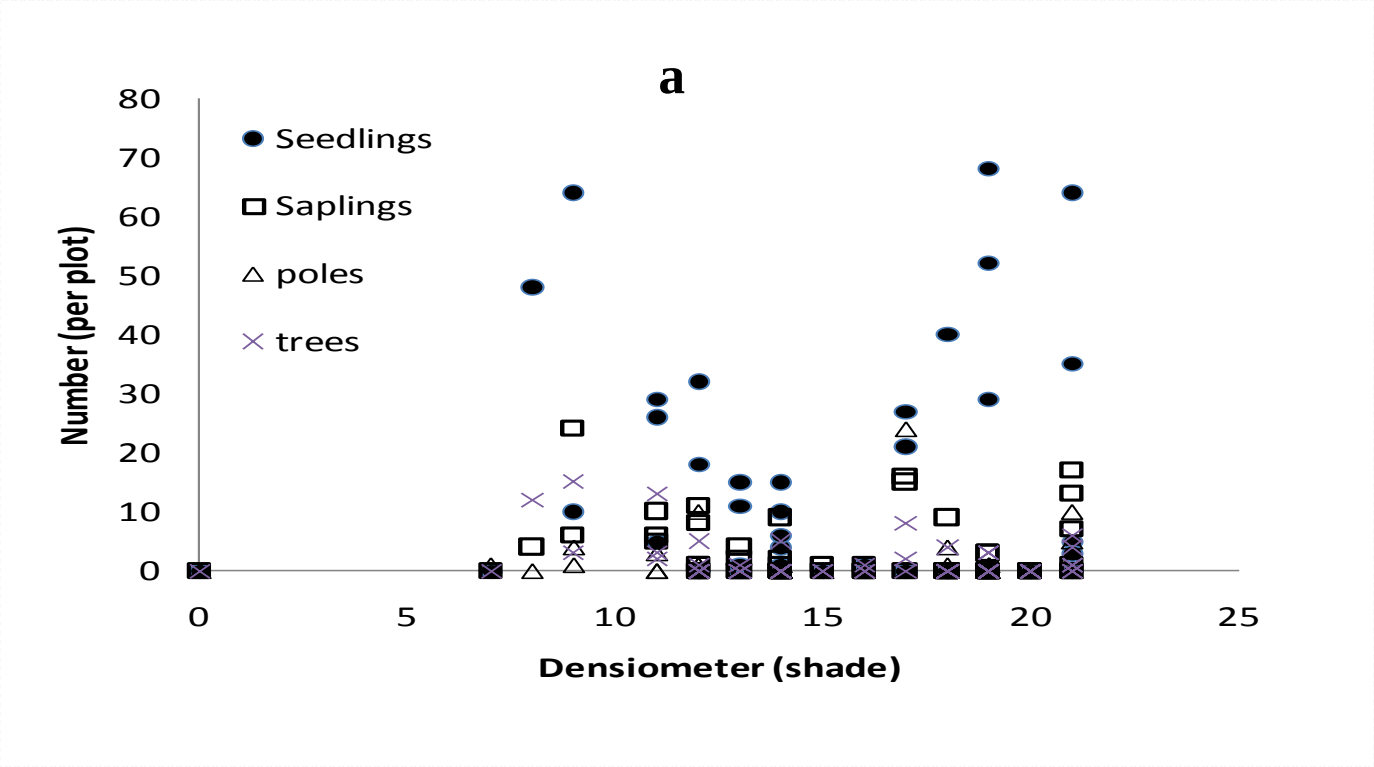
## Implications from the graphs

- Fig. 4 Population structure of the alien plant species in S NP. **a =** *T. cacao*, **b =** *C. canephora*, ***c*** *= S. spectabilis and* ***d****= C. odorata.*

- *S. spectabilis* showed a degenerating population in the primary forest (Fig. 4. c).

- The species *T. cacao*, *C. canephora C. odorata*, *and* had an inverse J-shape population structure in both the primary and secondary forests (Fig. 4. a, b and d).

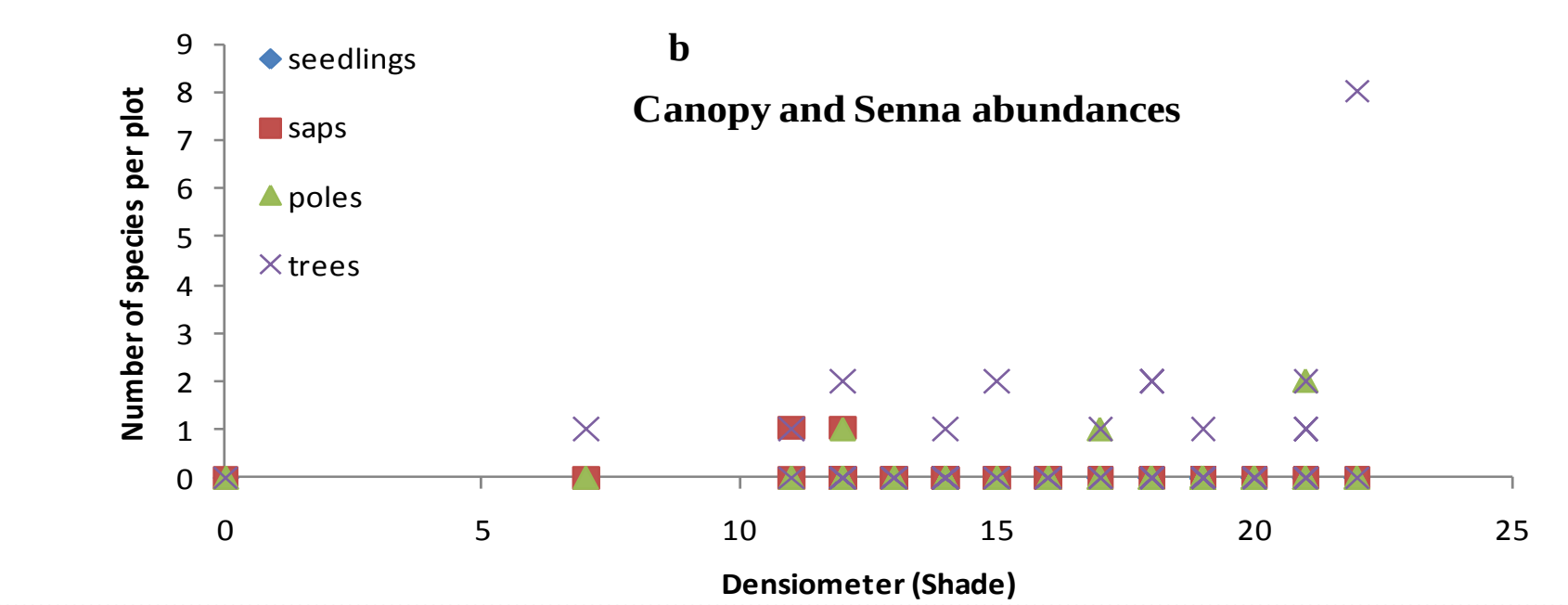
# Fig. 5. Relationship between canopy *C. odorata* species abundance




- Canopy cover generally increases with increase in *C. odorata* seedlings from secondary to the primary forest 5.(a)

- The high abundance of *C. odorata* seedlings the primary forest indicates high invasion potential.

# Relationship between canopy *S. spectabilis* abundance




- Canopy cover generally increases with increase in *S. spectabilis* trees from secondary to the primary forest 5.(b)

- The high abundance of *S. spectabilis* trees in the primary forest indicates a degenerating alien species with no potential to invade.

# Conclusions and Recommendations

**Conclusions.**

- From the study, *C. odorata* has exhibited some invasion potential in some sites as it is abundant in the $1^0$ forest in seedlings stand form.
- In most sites, *S. spectabilis* species had a high abundance of old trees in both primary and secondary forests, it can therefore be concluded that they are a dyeing/degenerating population.
- Data analysis is still on going better conclusions will be drawn.

**Recommendations**

- The SNP management should prepare a management plan for the plants with the potential of becoming invasive in the park.
- More studies on Senna since its invasive potential may be just inhibited by some factors not studied yet.
- Further studies in what ways alien plants (if found invasive) may exhibit/ show their invasive potential to the native plants.

# Acknowledgements

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Patrick




## Research Team