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Topic:

**Diversity and Distribution of Canopy Hemi-Parasitic Plants  
in Bwindi Impenetrable National Park, south western  
Uganda**

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# Definitions

- Canopy hemi-parasitic plant
- A plant living on another plant's branches/stems and obtaining water and/or nutrients from it
- host and parasite are jointed by 'hostarium' (Kuijt, 1969)
- Hostaria are specialized structures
  - connect the vascular system of the parasite and host

Attachment point of the parasite to the host



# Diversity

- Which parasites exist in Bwindi forest and where?
- Plant diversity is important, many species depend on other; therefore, elimination of one can cause wider impacts.
- Conservationist seek to preserve plant diversity by protecting ecosystems that contain rare and vulnerable plants

E.g. parasitic plants

- **Distribution**

The pattern how parasites appear in Bwindi, on different host and areas;

- Altitudes and slope.

# Why a study of these parasites in Bwindi?

Parasitic plants occur in many ecosystems including tropical rain forests,

1% of angiosperms (Press, 1998)

- Capable of altering ecosystem productivity (Marvier 1998),
- Interactions are competitive (Gibson & Watkinson 1991; Matthies 1996),
- likely associated with stress
- Can alter plant community structure (Gibson & Watkinson 1992; Press 1998).
- Many are bird pollinated (also insect or/and wind)
- Primarily dispersed by birds



Englerina sp

# *Englerina woodfordiodes*



## Cont.....

- Some parasites provide fruit, seed, nectar as food to animals
- Keystone resource in many ecosystems (Watson, 2001)
- positively affect ecosystems' diversity in forest habitats (Nickrent *et al.*, 2004)
- Parasites possess conservation values in their own right

But are poorly studied

e.g.

- Diversity and distribution
- Impacts
- Vulnerability

All these links/values and effects may be vulnerable to changing climate



# Statement of the problem

- Parasitic plants are present in Bwindi forest and
  - ✿ in neighboring gardens
  - ✿ no botanical study done to ascertain their presence
  - Hence, little is known:
    - Identity
    - Diversity
    - Distribution (in terms of host specificity or preference) and altitude
    - Abundance and richness
    - Ecology

Lack of this information limits potentials for biodiversity conservation planning

- A pilot study was needed to provide a baseline on parasites in Bwindi

# Study area

- Bwindi covers 331 km<sup>2</sup>
- tropical forest spread over steep ridges and valleys
- located on the eastern edge of the Albertine Rift Valley and, believed to be a Pleistocene refugium,
- recognized biodiversity hotspot
- divided into the four management sectors i.e. (Northern, Southern, Western and Eastern)  
which form the basis for the study and transect placements

# Location of study sites in Bwindi

Sites included: Nkuringo, Rushaga, Bamboo zone, Ruhija, Kitahurira, Buhoma, Hamihingo and Byumba



# Study objectives

## ■ General objectives:

Aimed at inventorying the canopy hemi-parasitic plant species in Bwindi with the view of understanding their diversity and distribution in terms of host specificity and preference

## ■ Specific objective

- Determine the diversity of canopy hemi-parasitic plants in the four management sectors of Bwindi
- Determine the distribution of hemi-parasitic plants in relation to host plant characteristics:
  - e.g.
    - Nature of the bark
    - Nature of the wood
- Identify environmental factors affecting diversity and distribution of parasites in Bwindi

# METHODS

- The four management sectors form the basis for placement of transects
  - A transect of 1 km long and five (5m) meter on either side was randomly sited in each sector along the trail (interior transect)
  - Another transect of the same size, randomly sited along the park edge (forest edge)
  - And finally another transect of the same was placed along the forest road (communication lines)
  - Also opportunistic sampling method to capture records outside sampled areas

# Analysis

- Regression analysis was used to determine if a relationship between;
  - the host bark rugosity,
  - diversity and
  - distribution of parasites in the entire park
- A canonical ordination of (CAP 4) was employed to relate parasitic plants and local environmental variables

# Findings and Results

- Overview of findings:
- 545 station records in 12 ha
- 1452 individual records
- 22 parasite species on 48 woody host species
- On varying altitudes and slopes
- The most common parasites
- Common host species.

## The most common parasites

<b>Hemi-parasite Species</b>	<b>f</b>
<i>Vis.trif</i>	372
<i>Phragamenthera usuiensis</i>	243
<i>Englerina woodfordiodes</i>	235
<i>Viscum fischeri</i>	196
<i>Agel.ente</i>	107
<i>Englerina schubotziana</i>	104
<i>Agelanhtus brnneus</i>	82
<i>Englerina SP 111</i>	21



## Parasites cont...

<i>Phragmanthera Sp</i>	18
<i>Tapinathus constrictifioides</i>	18
<i>Aglenthus Sp</i>	15
<i>Vis.combr</i>	15
<i>Globimatula braunii</i>	10
<i>Englerina Sp 1</i>	8
<i>Agel.djure</i>	1
<i>Olirella trildebrandtii</i>	1
<i>Phragmanthera Sp 1</i>	1
<i>Phragmanthera Sp 11</i>	1
<i>Tapinathus buvumea</i>	1
<i>Tapinathus constrictus</i>	1
<i>Viscum congolensis</i>	1
<i>Phrag Sp 111</i>	1
<b>S=22</b>	<b>1452</b>

# Common hosts

## Host species

## Frequencies

Macaranga kilimandscharica

89

Millettia dura

67

Maesa lanceolata

65

Harungana modagasariensis

36

Sapium elipticum

34

Macaranga barteri

19

Psychotria mahonii

15

Allangium chinense

12

Neoubotonia sp

12

Bridelia micrantha

8

Ficus capense

6

Teclea nobilis

6

Albizia gummifera

5

Ficus sp

5

Neoboutonia macrocalyx

5

Newtonia buchananii

5

## Common host ...

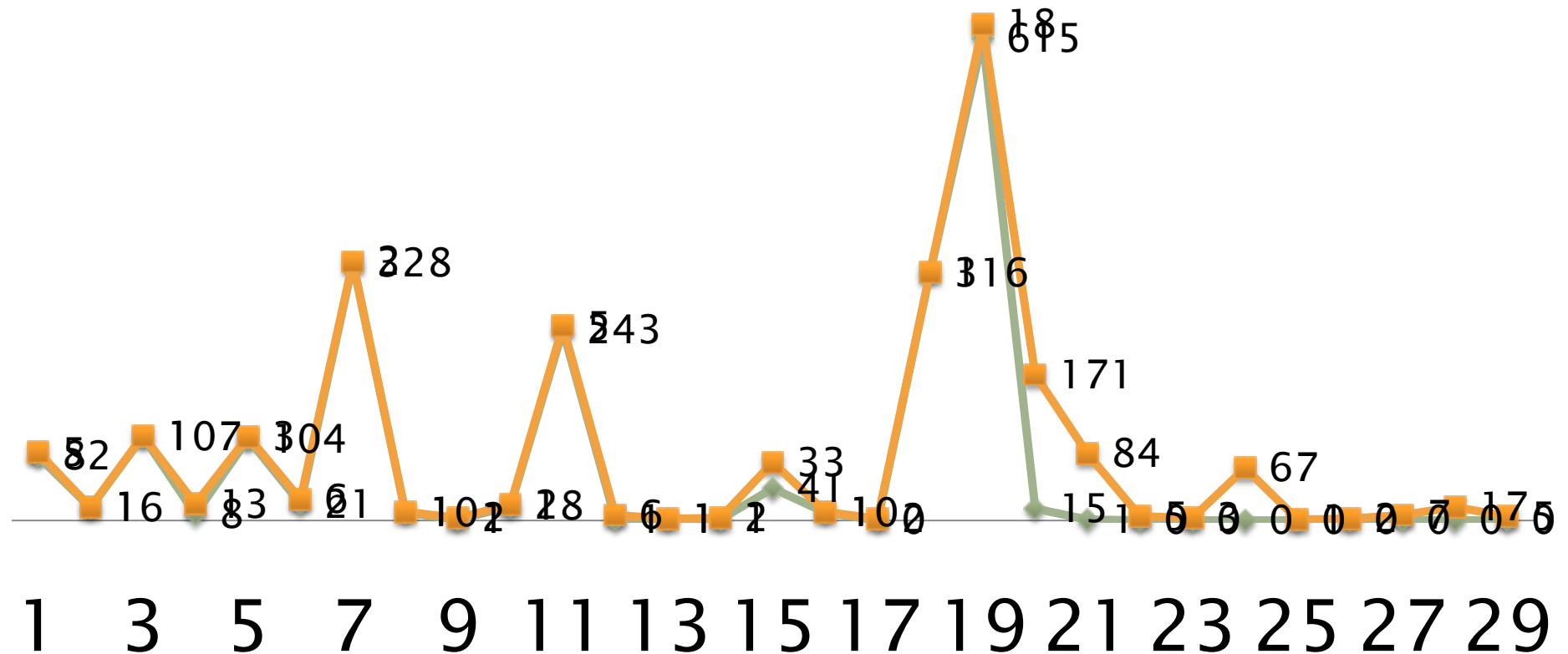
<u>Host species</u>	<u>Frequencies</u>
<u><i>Macaranga kilimandscharica</i></u>	<u>89</u>
<u><i>Millettia dura</i></u>	<u>67</u>
<u><i>Maesa lanceolata</i></u>	<u>65</u>
<u><i>Harungana modagasariensis</i></u>	<u>36</u>
<u><i>Sapium ellipticum</i></u>	<u>34</u>
<u><i>Macaranga barteri</i></u>	<u>19</u>
<u><i>Psychotria mahonii</i></u>	<u>15</u>
<u><i>Allangium chinense</i></u>	<u>12</u>
<u><i>Neoubotonia sp</i></u>	<u>12</u>
<u><i>Bridelia micrantha</i></u>	<u>8</u>
<u><i>Ficus capense</i></u>	<u>6</u>
<u><i>Teclea nobilis</i></u>	<u>6</u>
<u><i>Albizia gummifera</i></u>	<u>5</u>
<u><i>Ficus sp</i></u>	<u>5</u>
<u><i>Neoboutonia macrocalyx</i></u>	<u>5</u>
<u><i>Newtonia buchananii</i></u>	<u>5</u>
<u><i>Rhytegyinia rwenzoriensis</i></u>	<u>4</u>
<u><i>Markhania lutea</i></u>	<u>3</u>
<u><i>Persea americana (Avacado)</i></u>	<u>3</u>
<u><i>Prunus african</i></u>	<u>3</u>
<u><i>Carapa grandiflora</i></u>	<u>2</u>
<u><i>Maesopsis eminii</i></u>	<u>2</u>
<u><i>Pinnus pacula</i></u>	<u>2</u>
<u><i>Strombosia scheffleri</i></u>	<u>2</u>
<u><i>Trema orientalis</i></u>	<u>2</u>
<u><i>Trichilia rubescens</i></u>	<u>2</u>

# Result

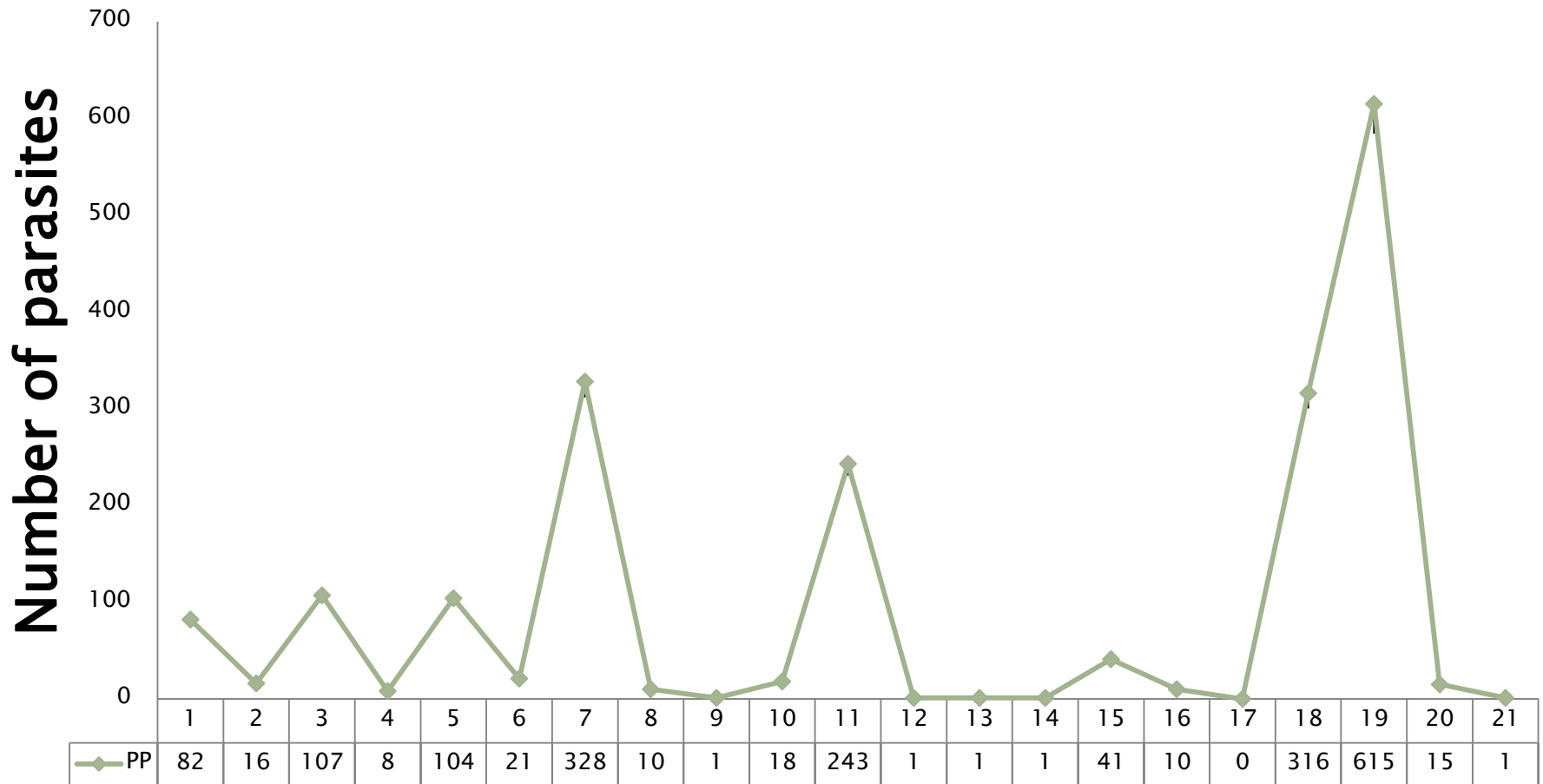
Diversity and distribution of parasites among hosts in all study sites

Number of host recorded per parasite during the study

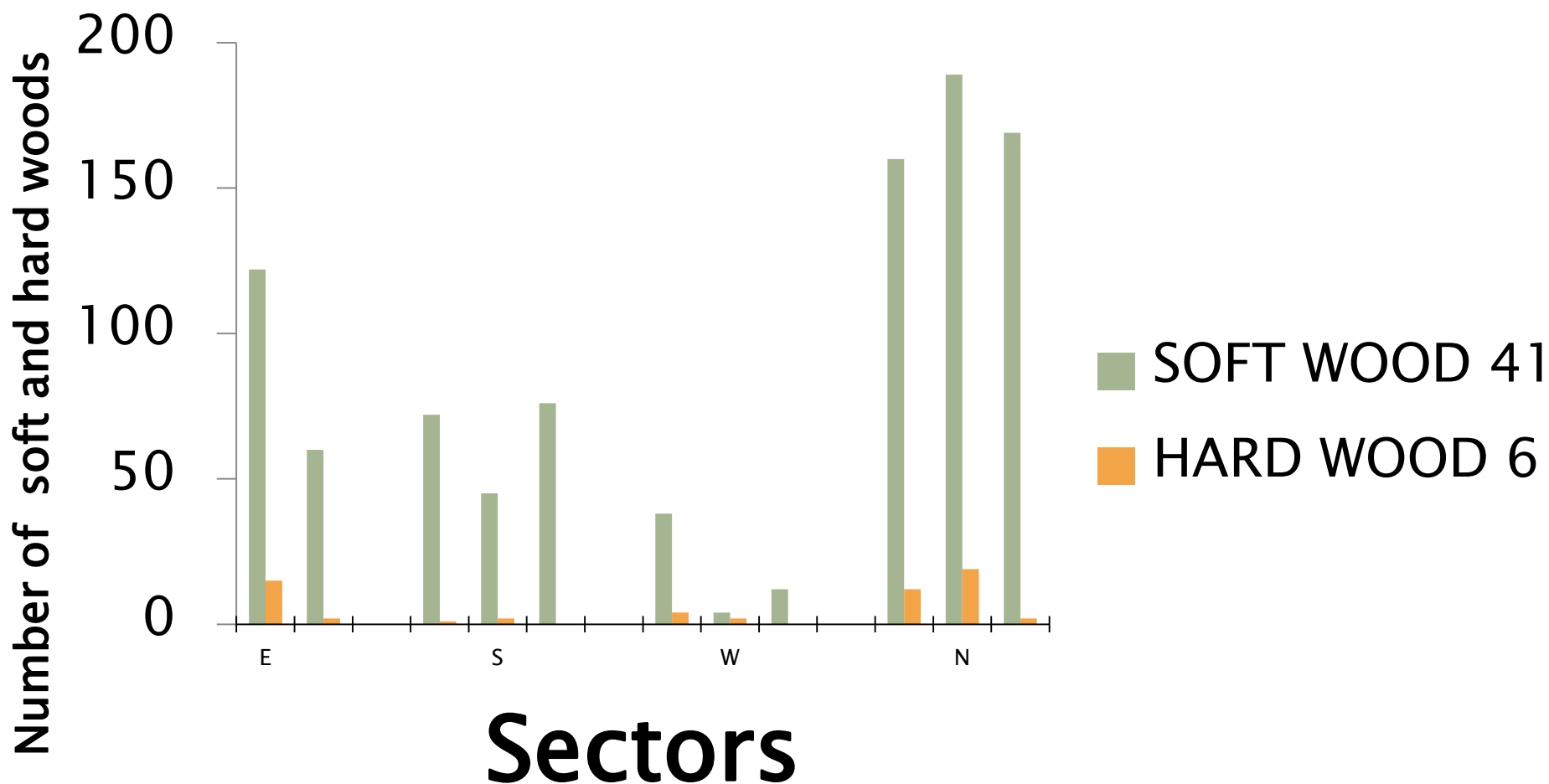
PP Hosts



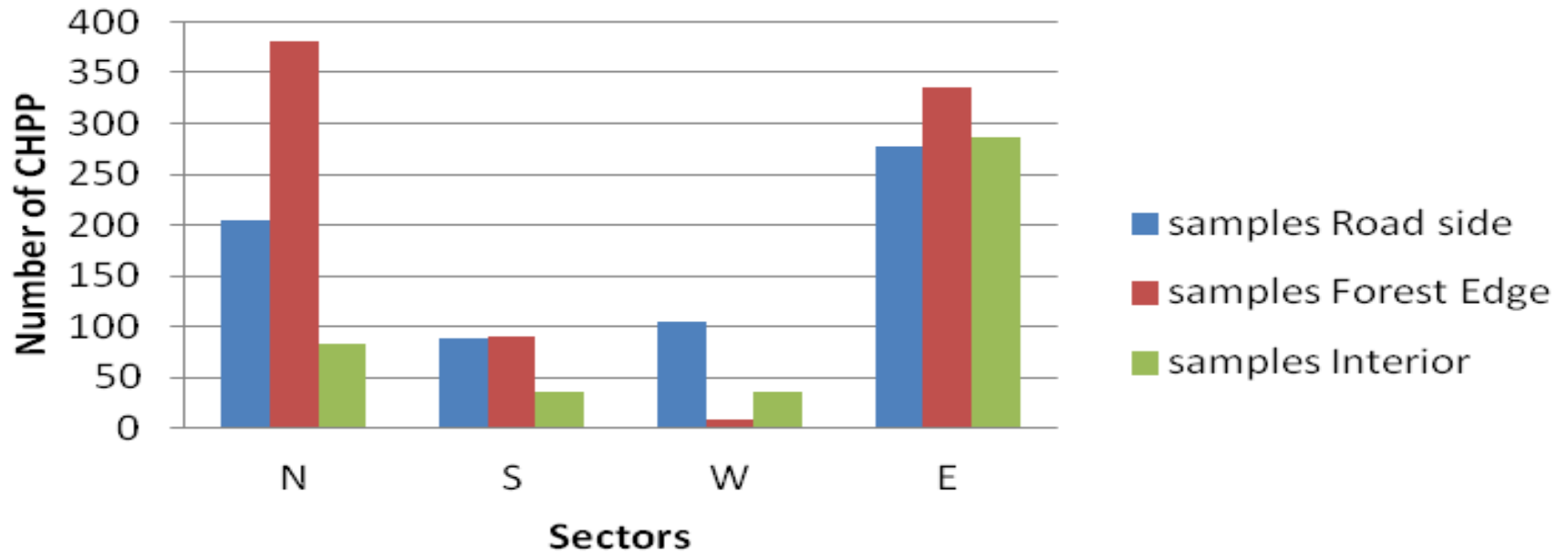
# Number of parasite species recorded per host species in the entire study area



# Host numbers of hardwoods and soft woods recorded per transect in each sector



# Diversity and distribution of CHPP in BINP

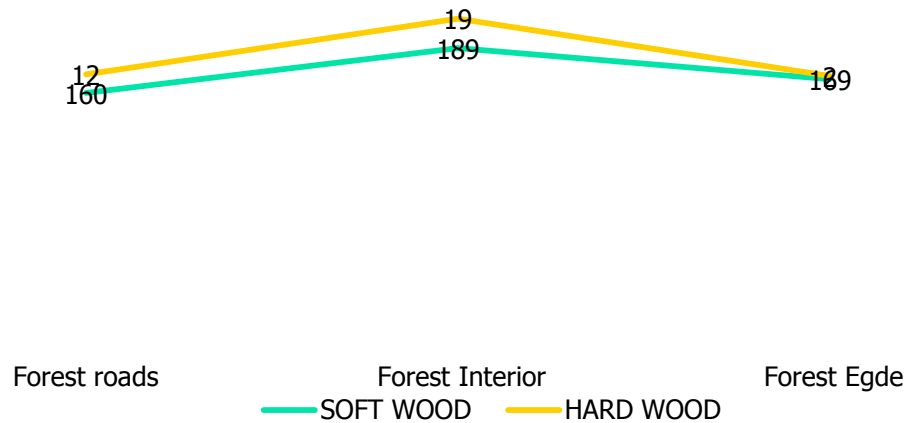


Distribution and diversity of parasites in all the study sites in Bwindi along forest roads, edge and forest interior in all the sectors.

# Findings and Results

- Rank abundance of parasites in Bwindi

## CHPP Diversity and Distribution in relation to host characteristics of nature of wood



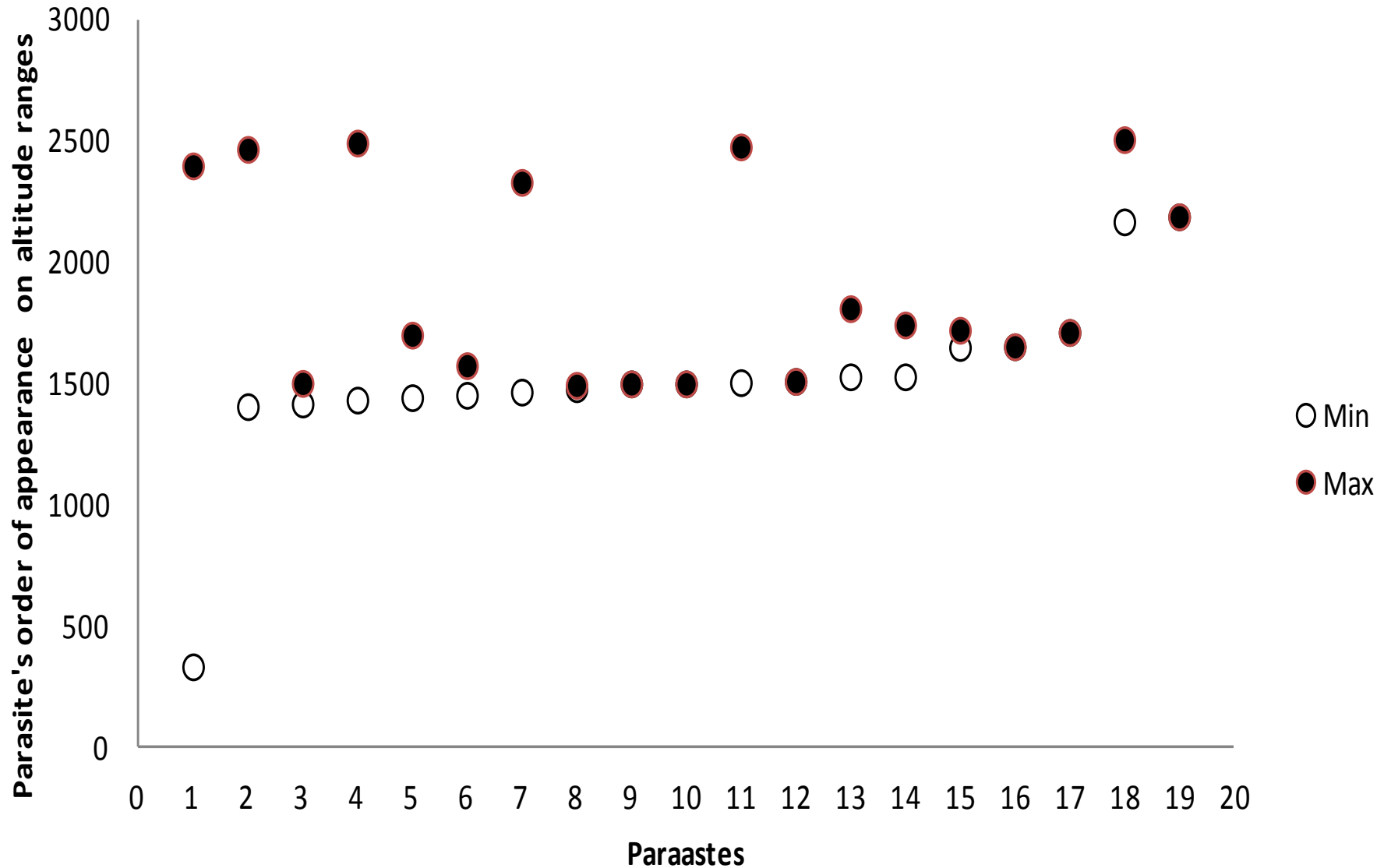
High diversity and distribution was found among soft wood host species, low distribution among hard wood host species.

Hard woods ranking from 2 through 17 to 19 tree species

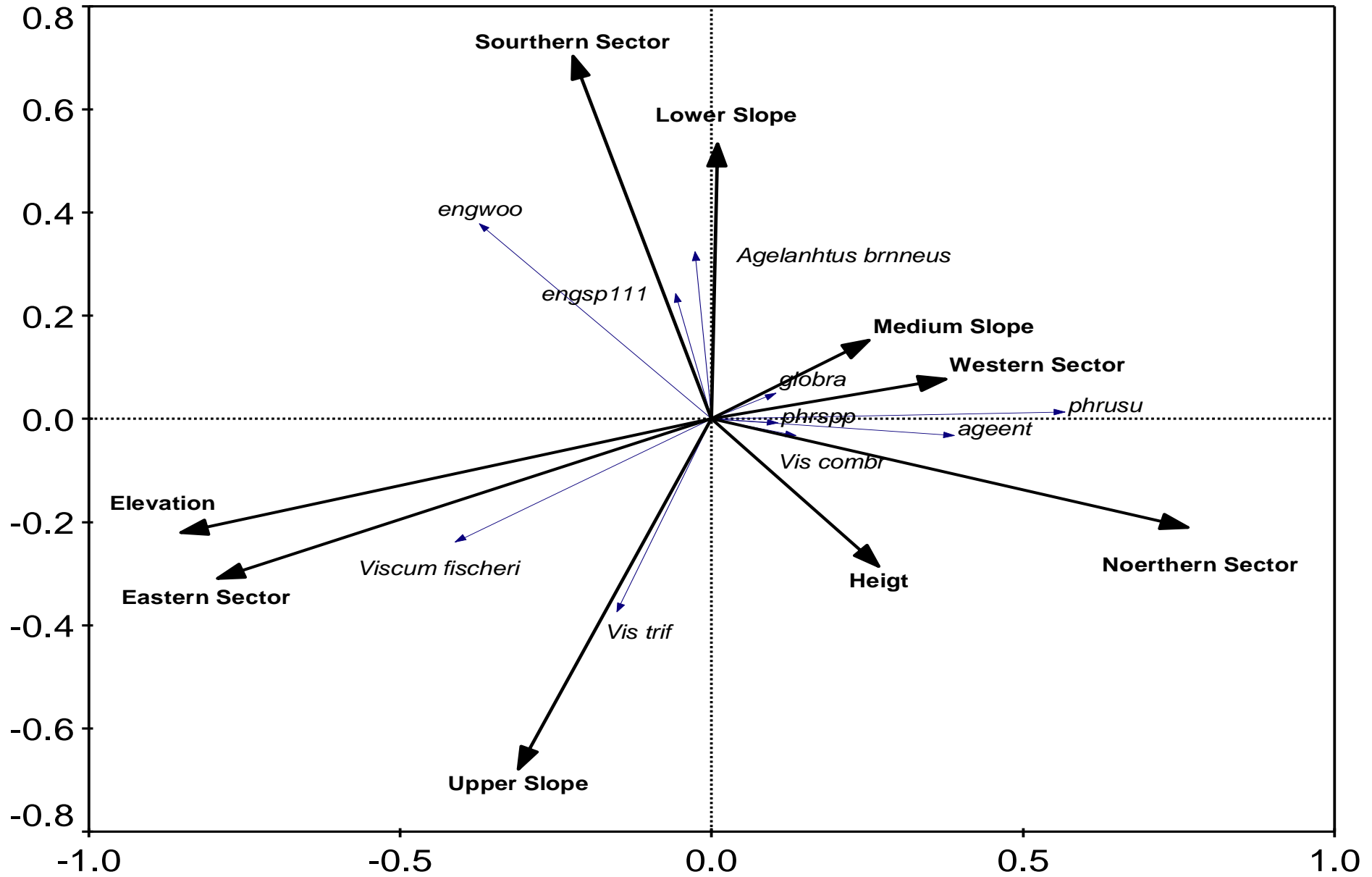
Soft woods ranking from 160 through 169 to 189 tree species



# Distribution of parasites along different altitudes



Order of parasites from lowest minimum to highest minimum altitude



A canonical ordination was employed to relate parasitic plants and local environmental conditions



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# Conclusions

Parasites prefer mid altitude to high and low

Smooth bark host trees were preferred by parasites to rough bark hosts

*Phragmenthra* sp were more common in Bwindi than others

*Visicum triflorum* was seen almost in all study sites

Impacts on hosts still remain uncertain

Vulnerability of host may be structural

# Recommendations

- Records on parasite emphasizes the need for inventories and deeper studies:
  - relationships parasites with hosts
  - the main dispensers and pollinators in Bwindi
  - Ecological impacts on plants communities
  - Other benefits to mankind
- It is not very clear whether environmental factors and host characteristics are the major cue for the diversity and distribution of parasites, a study to ascertain this is important



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Thank you for  
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