Summer habitat utilization & sexual segregation in markhor *Capra falconeri* in Jammu & Kashmir, India

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Introduction

- Markhor- Highly endangered wild goat (IUCN – Endangered; WPA – Schedule 1).

- Distributed in south & central Asia

- Subspecies of markhor :
  - Flare-horned
  - Straight-horned

Markhor in India

- Distributed along the *Line of Control*

- Political unrest in J&K, security main priority

- Baseline information on markhor was lacking

- Range wide markhor survey was undertaken in 2004-2005

Salient Findings of Markhor Survey

Figure 2b: Map showing the present distribution of Markhor in Jammu & Kashmir.
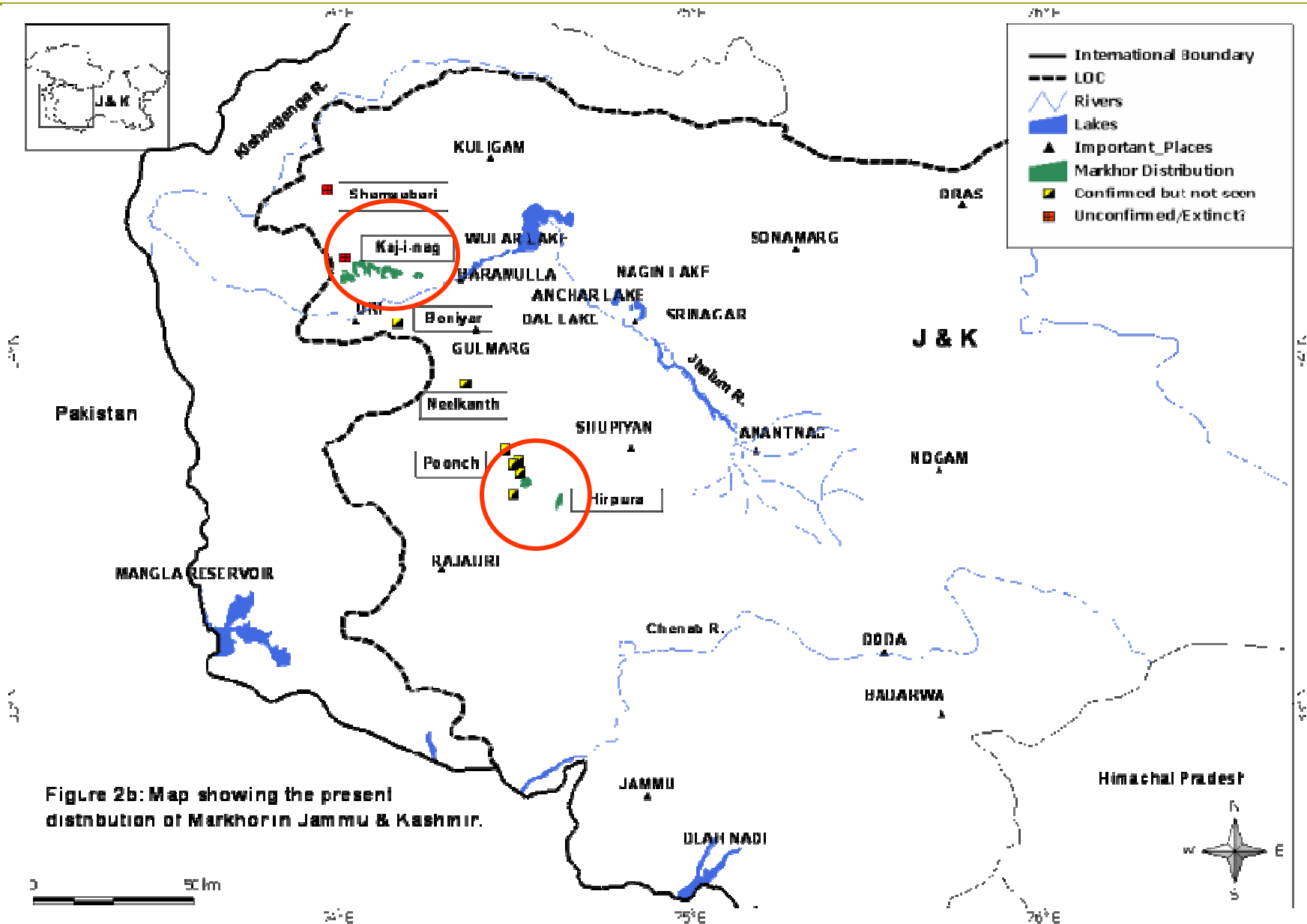
Salient Findings of Markhor Survey

- Main threats identified:
  - Poaching
  - Lack of awareness
  - Political unrest
  - Habitat fragmentation
  - Livestock grazing
  - Construction of road

Objectives

1. To study habitat selection by markhor

2. To study sexual segregation

Study Area

Limber WLS (44 km^2):
Kaj-i-nag range (North Kashmir)

Altitudinal range: 2000-4000m

Major vegetation types : pine, fir-spruce, birch, deodar, broad leaved

Other wildlife: common leopard, musk deer, western tragopan, goral etc

Methods

- Habitat use data was collected through
  - 16 Trails (2-3km/trails)
  - 6 vantage points
  - Repeated 4 times from April end to early August 2006.

- On sighting markhor the following variables were recorded:
  - Coordinates (plotted on a map)
  - Age-sex composition
  - Vegetation type
  - Terrain type
  - Vegetation cover
  - Aspect
  - Slope
  - Distance to escape terrain
 - Altitude

Analyses

- Descriptive analysis of population structure data
  - Group size, age-sex ratios

- Exploratory multivariate analysis using PCA
  - to identify the important variables determining habitat use
  - Mann-Whitney U tests to examine if males and females differ in their habitat use.
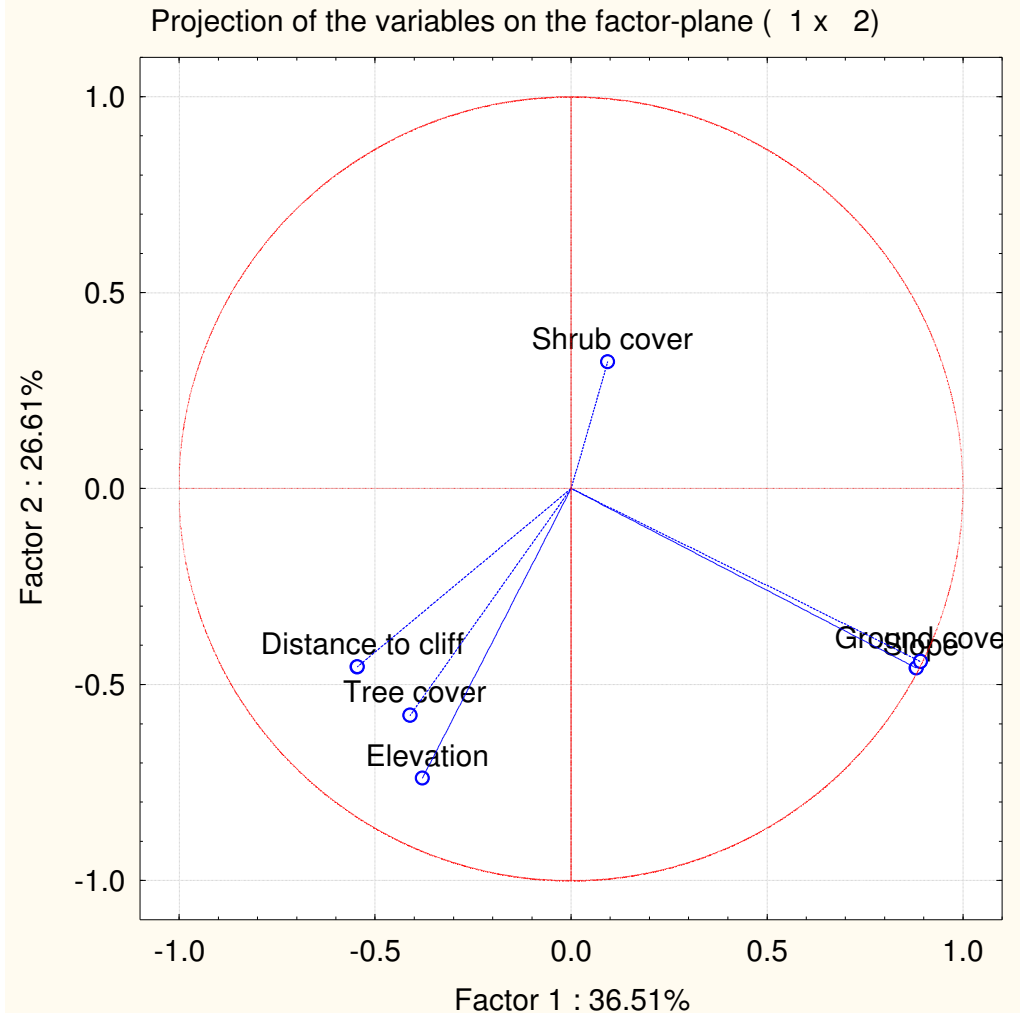
Results: Population

- Sighted 107 groups (475 individuals)

- Female groups (94), male groups (12), mixed group (1)

- Mean group size is 4.4 (± 3.7 SD)

Age sex ratio
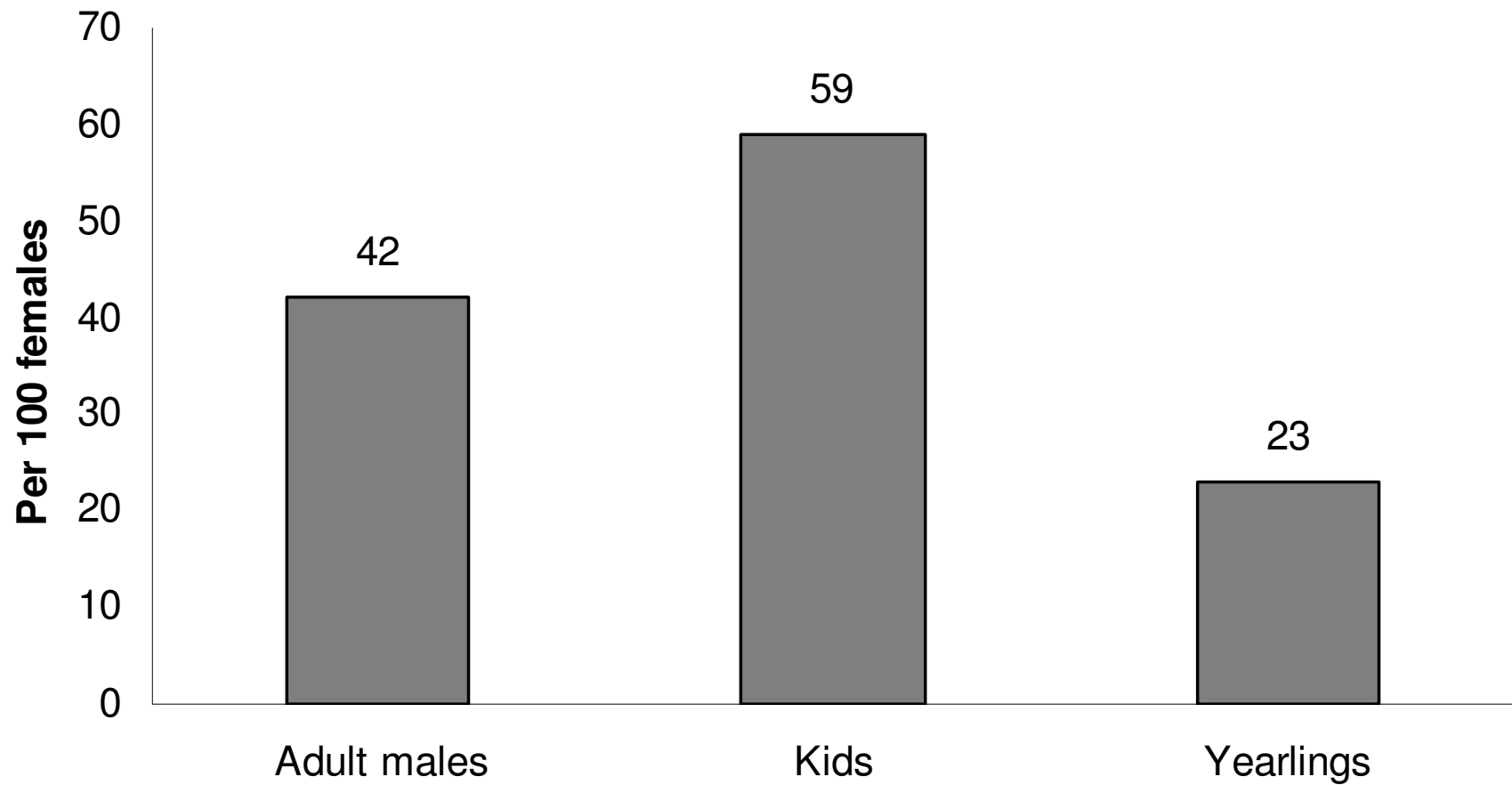
Results: habitat use & segregation

- PCA
  - The first two principal components accounted for 63% of the variation

- PC 1 correlations
  - + slope
  - + ground cover
  - - distance to cliffs

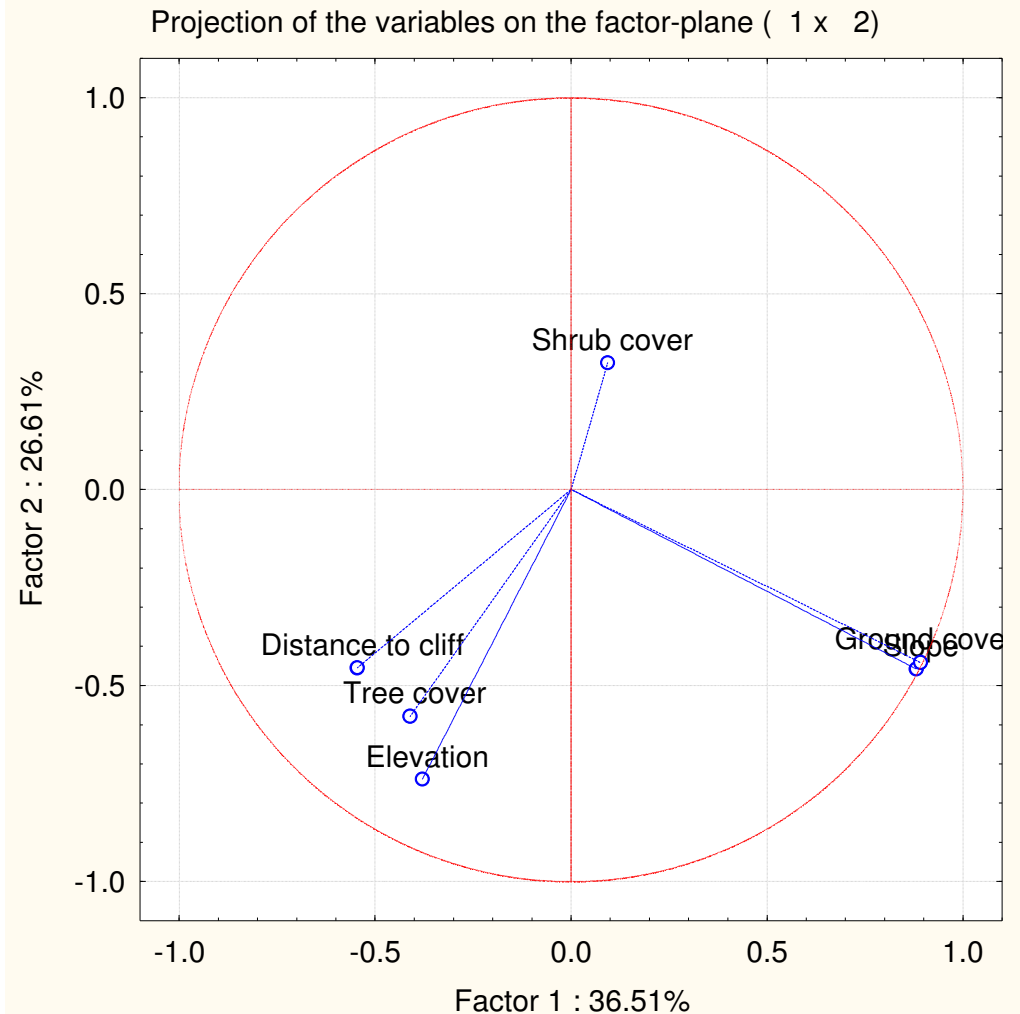- PC 1 represents a security axis (& food axis)

Projection of the variables on the factor-plane (1 x 2)

Factor 2 : 26.61%

Factor 1 : 36.51%

Shrub cover

Distance to cliff

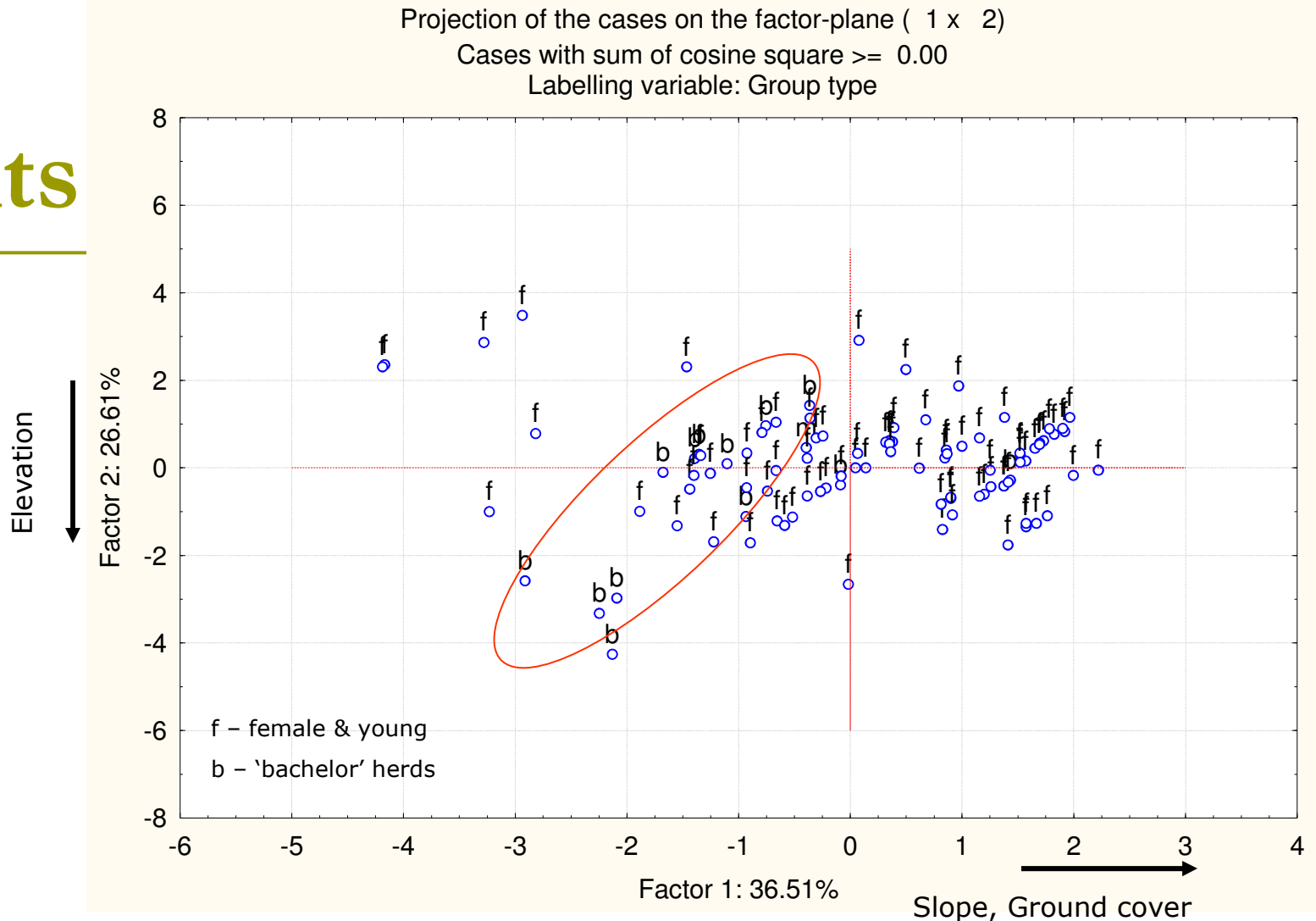Tree cover

Elevation

Ground cover Slope

Results

□ PC 2 correlations
   ■ - elevation
   ■ - slope
   ■ - tree cover
   ■ - distance to cliff
   ■ + shrub cover

□ PC 2 represents an elevation axis

Projection of the variables on the factor-plane (1 x 2)

Results

Projection of the cases on the factor-plane (1 x 2)
Cases with sum of cosine square >= 0.00
Labelling variable: Group type

f – female & young

b – 'bachelor' herds

Factor 2: 26.61%

Elevation

Factor 1: 36.51%

Slope, Ground cover

Dt. To cliff

- ◻ Overlaid the sightings on factor plane
- ◻ Females
  - ▪ scattered, seem associated with PC1 (security)
- ◻ Males
  - ▪ seem associated with PC2 (elevation)
- ◻ There seems to be a segregation at level of habitat: females in secure areas, males at higher altitudes

Summary

- ## Female distribution
  - seems to be determined by the need for neonate security
  - female areas had greater ground cover

- ## Males
  - use relatively higher areas with greater forest cover and low shrub and ground cover
  - Are the males in relatively sub-optimal areas?

Summary

- Spatial segregation – males gone outside SA
  - Autumn-Winter (rutting season), male/female ratio - 134:100
  - In summer, male/female ratio - 42:100
- Role of forest openings…
- Females seem to be in the best areas where neonate security as well as forage availability is maximized – Limber Valley
- A contrasting trade-off in the two sexes between the need to maximize body condition in males and neonate security in females…

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