Assessing local scale impacts of *Opuntia stricta* on arthropod assemblages in the Kruger National Park, South Africa

Kyle Harris

Department of Zoology and Entomology

Centre for Invasion Biology

University of Pretoria

Introduction

- Invasive alien organisms are one of the major threats to global biodiversity (Pimm *et al.* 1995).
- Arthropods play a crucial role in ecosystems and a change in their assemblages can potentially affect the entire ecosystem (Major *et al.* 2003).
- Biological invasions are known to have negative effects on invertebrates, by leading to extinction, reducing abundance and altering species composition (Greenwood *et al.* 2004).

Opuntia stricta

- Declared alien invader (Conservation of Agricultural Resources Act (Act 43 of 1983, Amended 2001)).
- In Kruger National Park invaded ± 30 000 ha of conserved land (Foxcroft & Hoffmann, 2000).
- Methods of control:
  - Mechanical
  - Herbicidal
  - Biocontrol
    1. *Cactoblastis cactorum*
    2. *Dactylopius opuntiae*

Biocontrol Agents

Introduction

- In KNP, invasive alien species (IAS) are the greatest threat to biodiversity ahead of traditional threats such as poaching and fragmentation (Foxcroft & Freitag-Ronaldson, 2004).

Kruger National Park Objective:

"To anticipate, prevent entry, and where feasible and/or necessary control invasive alien species, in an effort to minimize the impact on, and maintain the integrity of indigenous biodiversity" (Foxcroft & Freitag-Ronaldson 2004).

Objectives

1. To examine habitat specificity of beetles and spiders and variation in these assemblages, within a habitat system characterized by different levels of *O. stricta* invasions.
2. To identify groups of species that are characteristic of each *O. stricta* invasion level (indicators).
3. To identify groups of species that can be used to monitor changes in invasion levels (detectors).

The use of bioindicators

- Invertebrate groups are often used as ecological indicators to indicate shifts in the condition of environmental systems (Lawes *et al.* 2005).
- Beetles and spiders are known to be good indicators of habitat quality and change (Lawes *et al.* 2005).

Methods & Materials

- Skukuza Region.
- Beetles and spiders selected.
- Experimental design
  - 4 Treatments.
  - 5 Replicates of each, ≥ 50m apart.
  - 5 Pitfall traps in each replicate = 100 pitfall traps.
  - Sampling bi-monthly for 12 months between 2005 and 2006.
  - Traps left open for 10 days; cleared every 2nd day.
  - Additional methods for spiders; Active searching & leaf litter sifting.

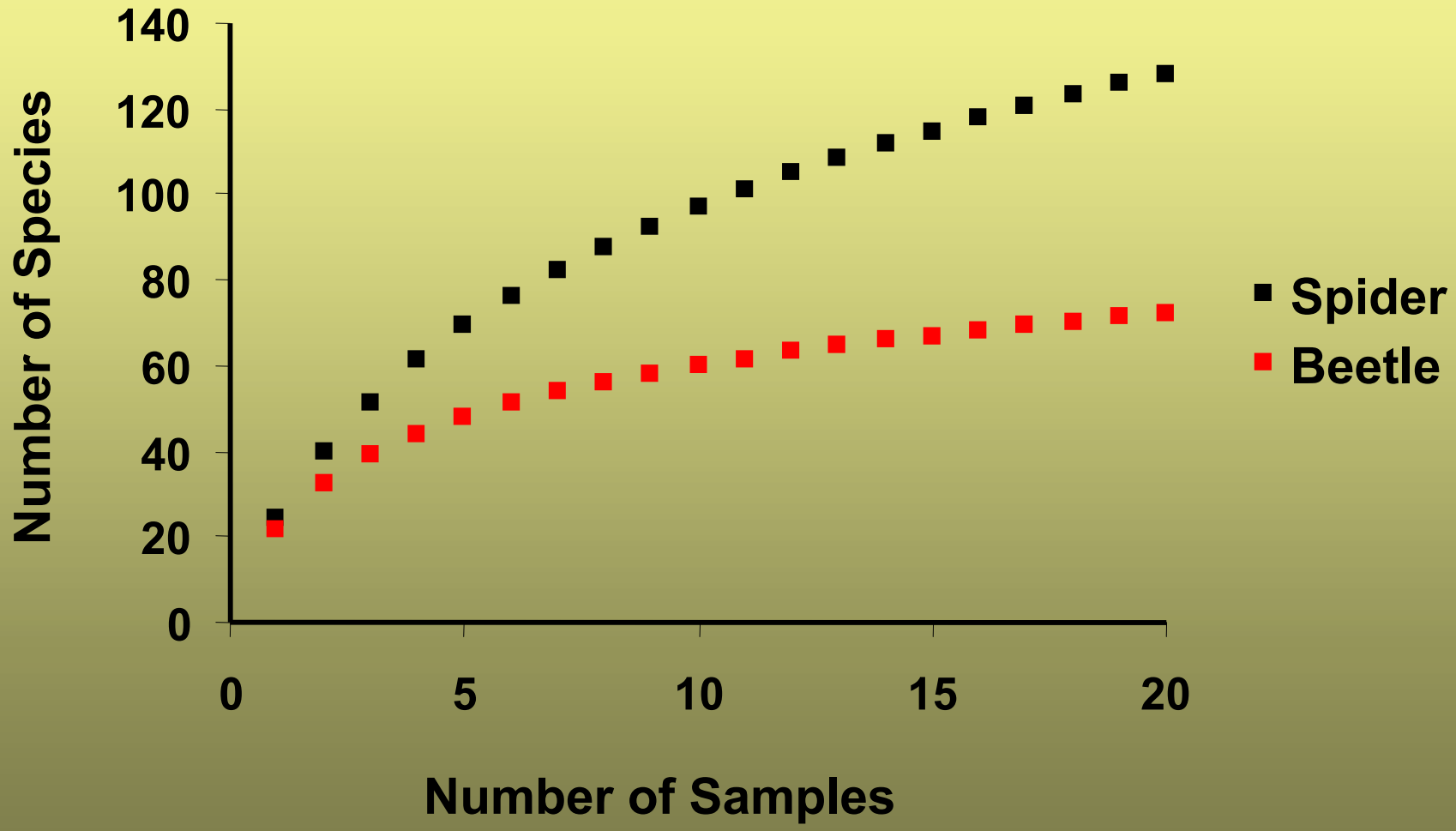
Treatment	Properties
High Infestation	Dense continuous patches ≥ 10m x 10m
Medium Infestation	Dense continuous patches ≥ 6m x 3m
Pristine	Fringe zone, where no *O. stricta* is found
Surrounded	Within high/medium infestations, but away from *O. stricta*

Results

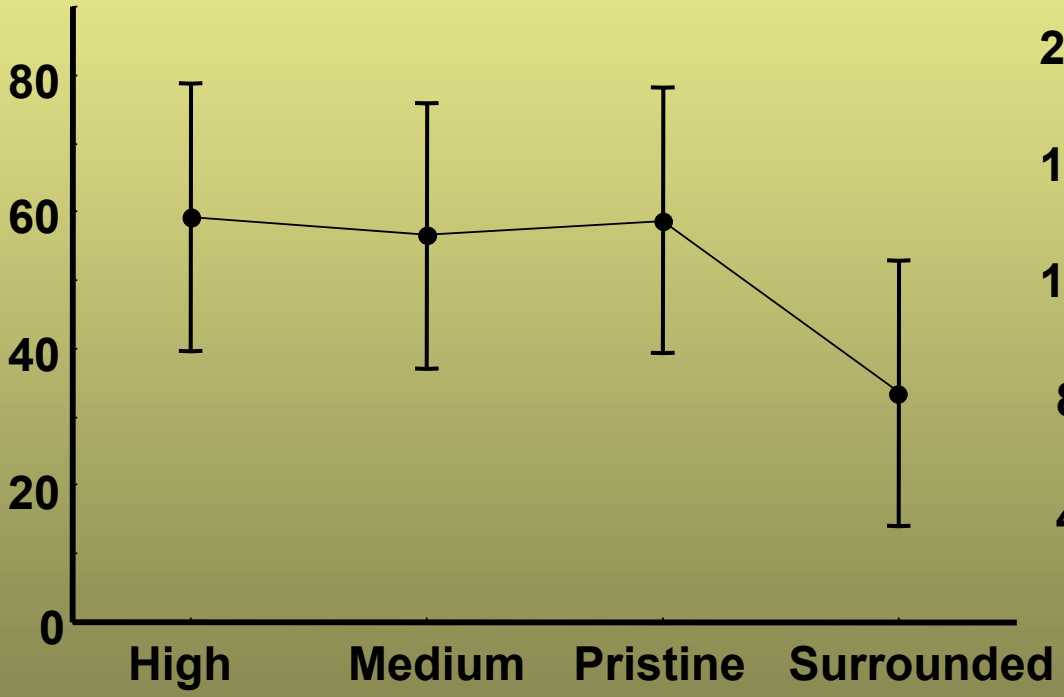
- 1042 individuals collected, representing 128 species in 29 families.
- 42 species are new records for KNP.
- 2 new species.

- 2160 Coleoptera individuals sampled. Representing 72 species in 11 families.

Species Accumulation Curves

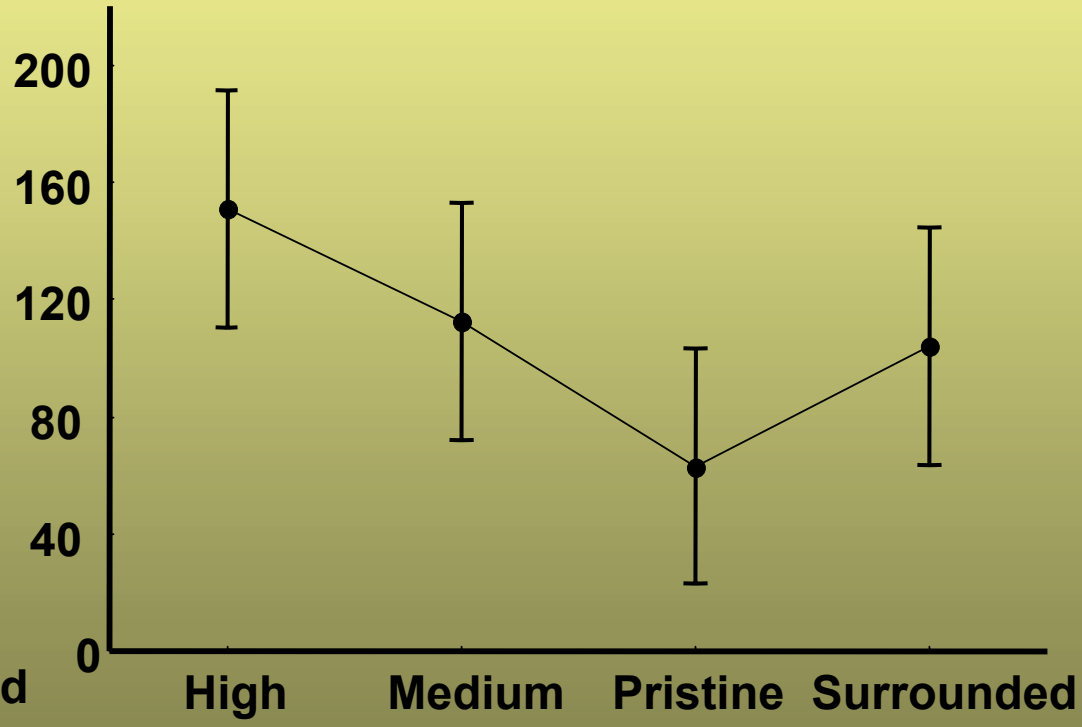


Spider & Beetle Abundance



F(3, 16)=1.8112, p=.18570

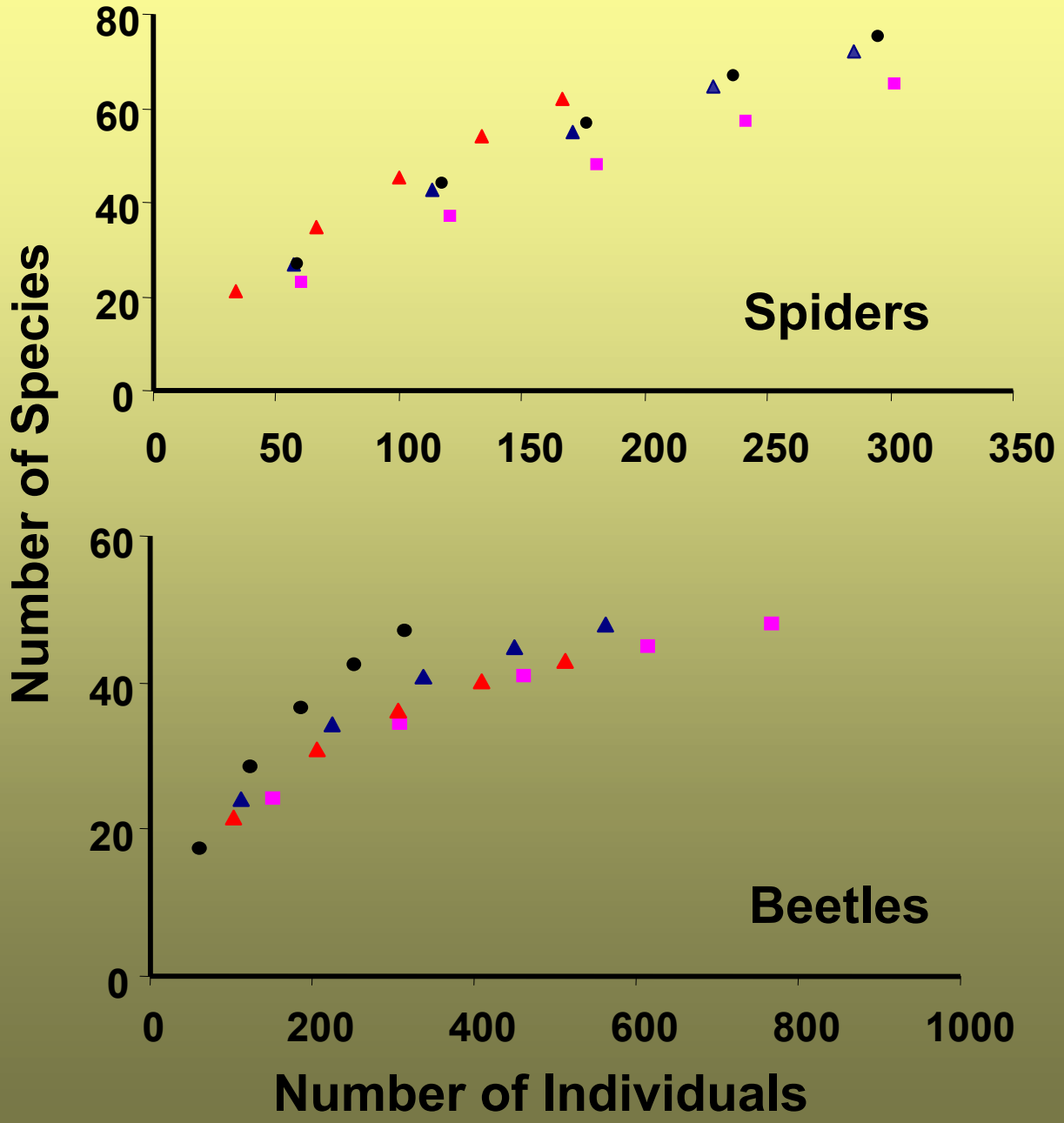
Spider



F(3, 16)=3.5637, p=.03797

Beetle

Spider & Beetle Species Richness

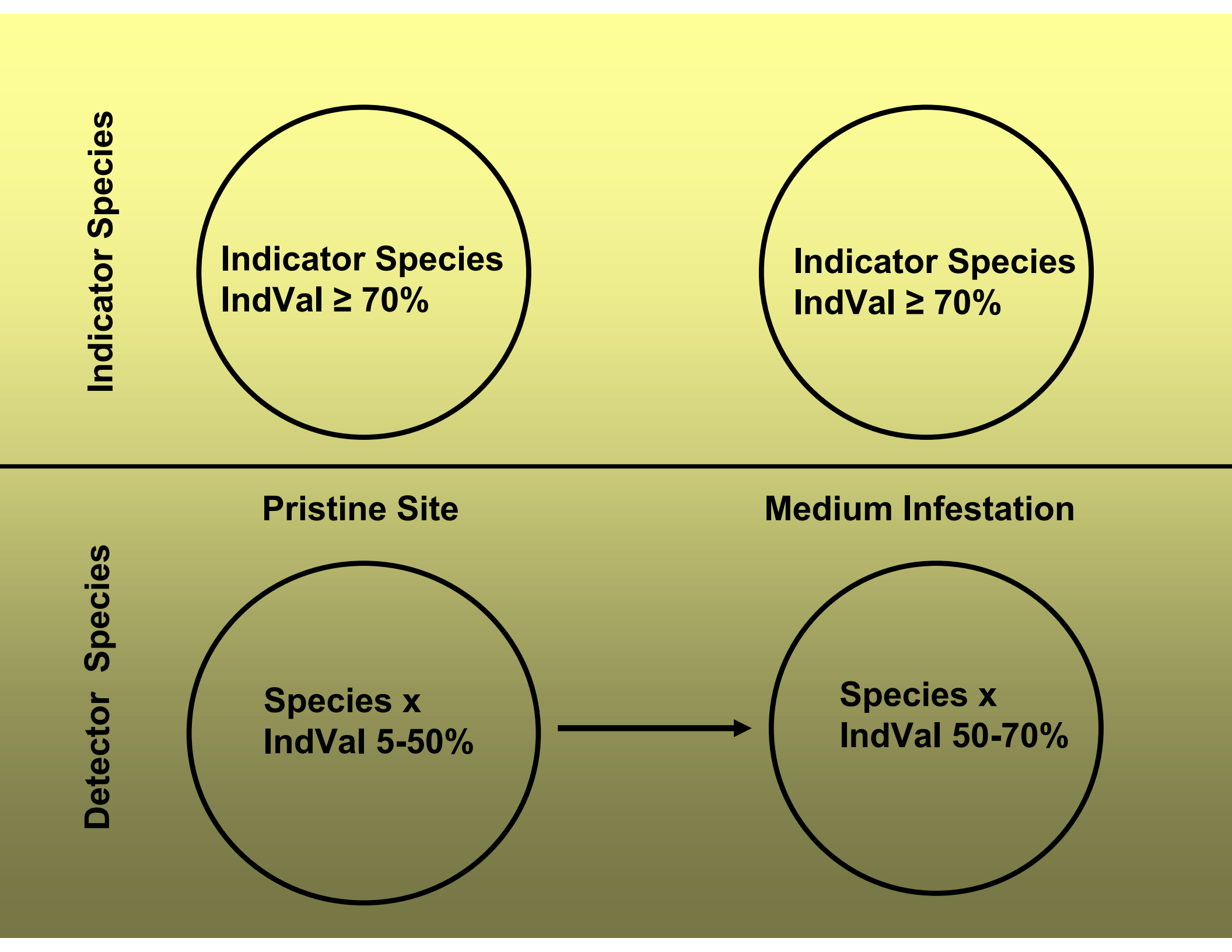


Treatment

- High Infestation
- Medium Infestation
- Pristine
- Surrounded

IndVal Method

- IndVal Method used to identify indicator and detector species (Dufrene & Legendre,1997).
- Assesses the degree (expressed as a percentage) to which each species fulfills the criteria of specificity and fidelity for each infestation level.


Indicator Species
Indicator Species
IndVal ≥ 70%
Indicator Species
IndVal ≥ 70%
Pristine Site
Medium Infestation
Detector Species
Species x
IndVal 5-50%
Species x
IndVal 50-70%

Species	Treatment	IndVal
N. chionogaster	M	66.67*
R. flavida	P	60*

Spider IndVals

Species	Treatment	IndVal
A. virgo	P	60*
P. uittata	P	60*
G. ignitus	S	57.14*
G. distinctus	H	55.88*
A. convexus	H	55.60*

Beetle IndVals

Concluding Points

- At the current infestation level, *O. stricta* has no effect on spider and beetle species richness.
- Due to the effectiveness of biocontrol agents.
- Set up of long term plots.
- Continuation of biocontrol programme.

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