How to assess Dispersal within Environmental Risk Assessment

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What is dispersal in our context?

- Dispersal is the exploratory, undirected movement of individuals from the habitat of origin (den Boer, 1990)

- We are talking about dispersal in the context of regulation (nt-effects) and thus…
- …virtually only about movements from the target habitat to non-target habitats!!

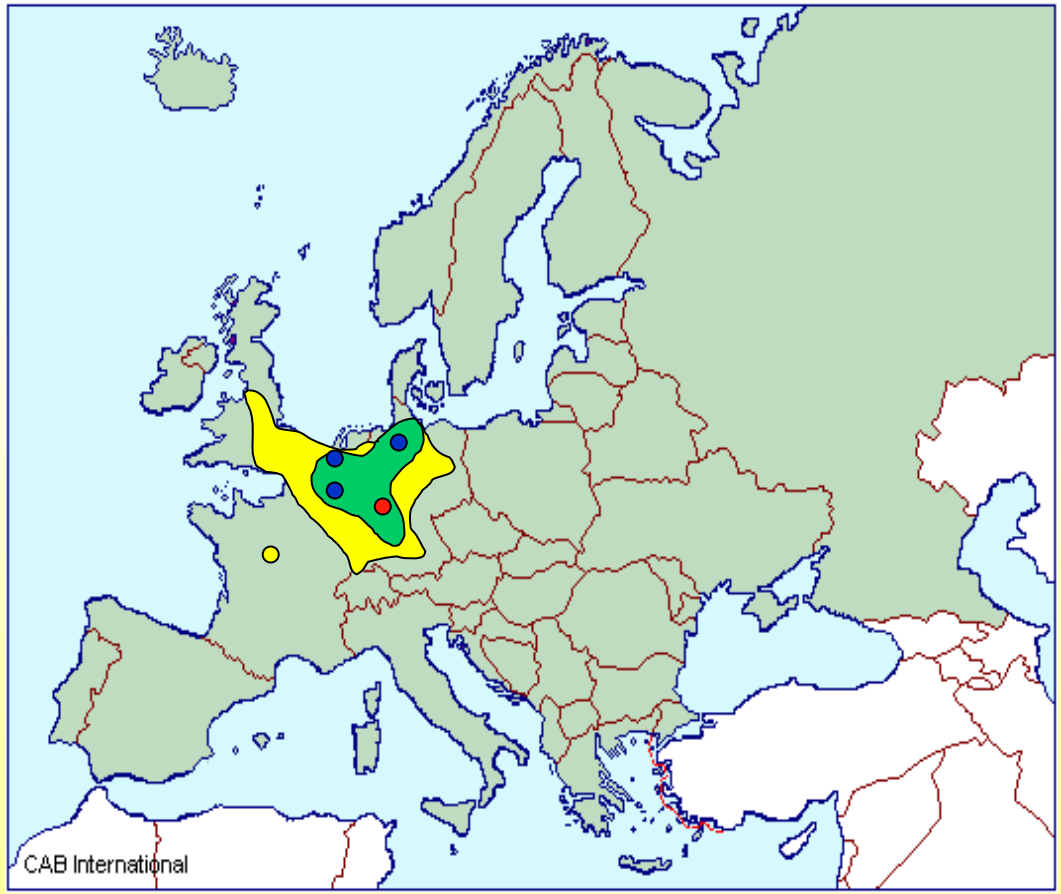
What can we measure?

- Only short term movements on a relatively small spatial scale (Trivial movements or true dispersal??)

What we can not measure:

- Longe range dispersal
- Man made dispersal

Example: Distribution of *Harmonia axyridis*



2000

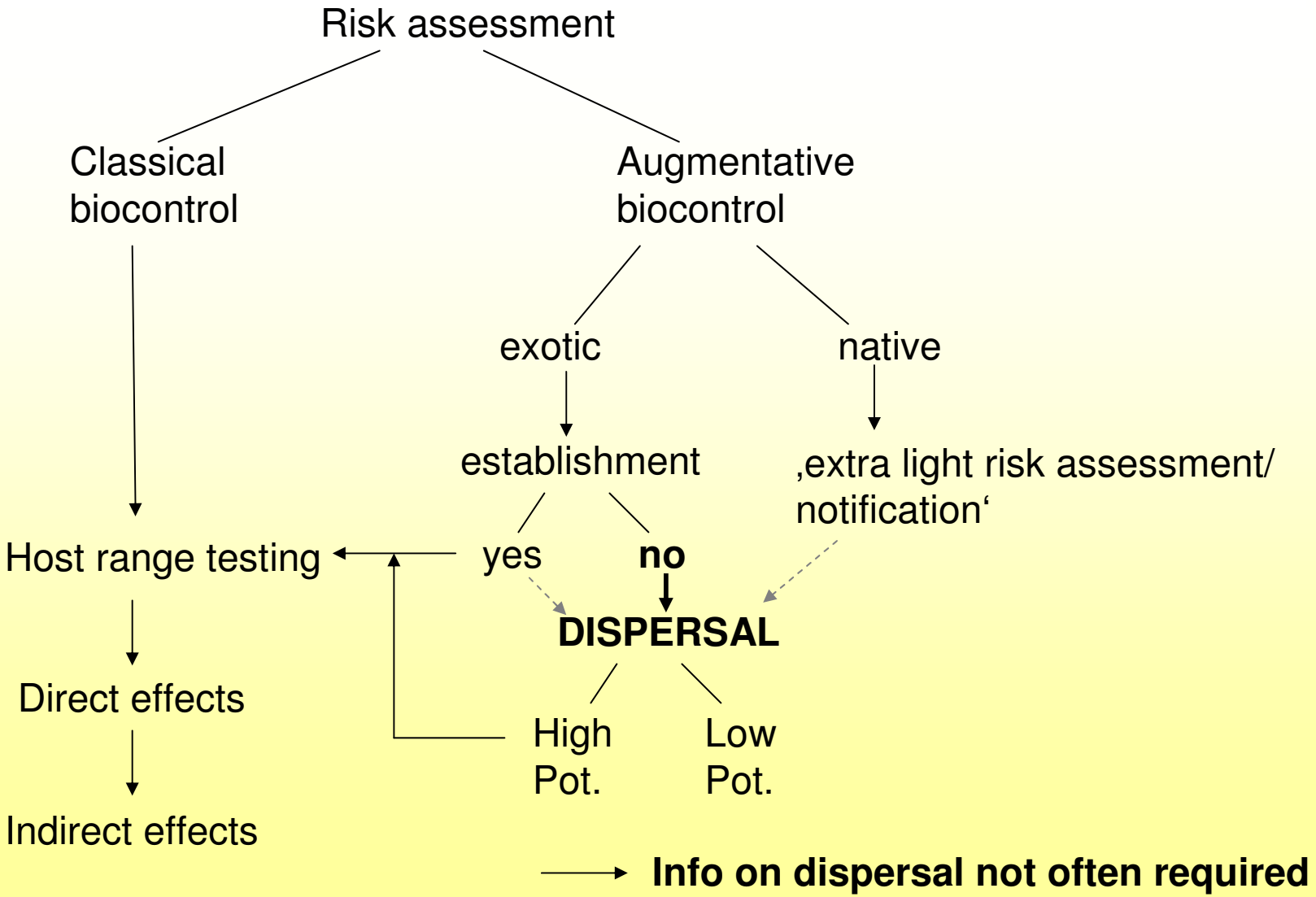
2002

2003

2004

From Antoon Loomans, Plant Protection Servcie NL

When is dispersal important?

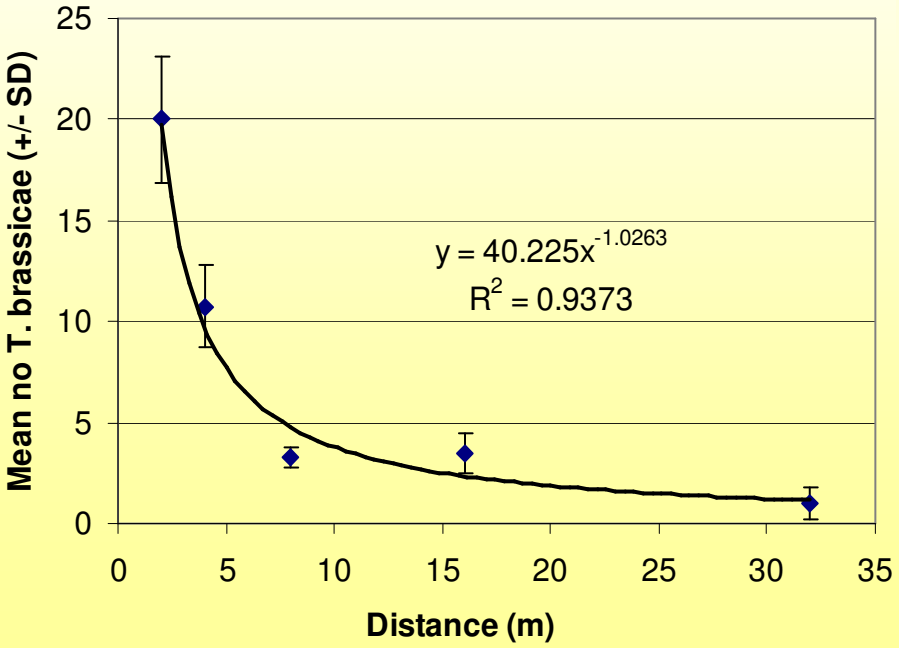


Dispersal questions:

Will they leave the greenhouse/field?

How far will they move?

…Longevity…



How to measure dispersal?

- Density curves in relation to distance
- Cumulative count or flux of marked individuals caught at a delimited boundary
- Recording of movements of individual insects

Density curves

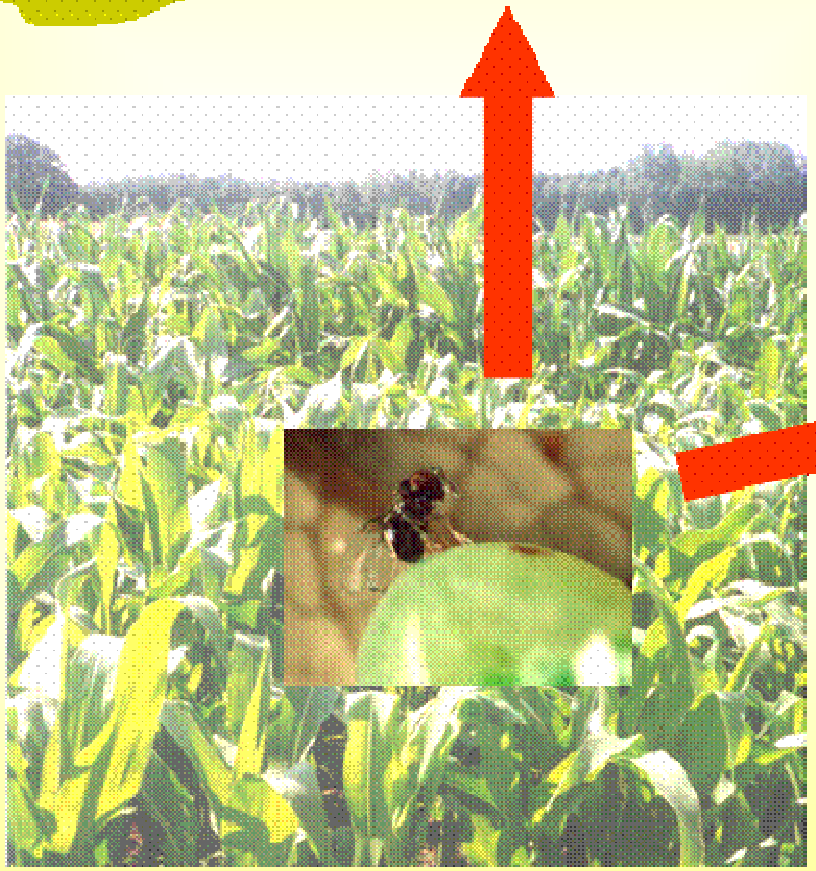
- **Mark-release-recapture (MRR)**
  - distinguish the dispersing natural enemies from wild population
  - Direct approach (any kind of trap) vs indirect approach (looking for parasitized hosts)
  - Traps can be attractive (baited) or not
  - Consider dilution effect
  - Time important
  - Habitat (and host availability) important

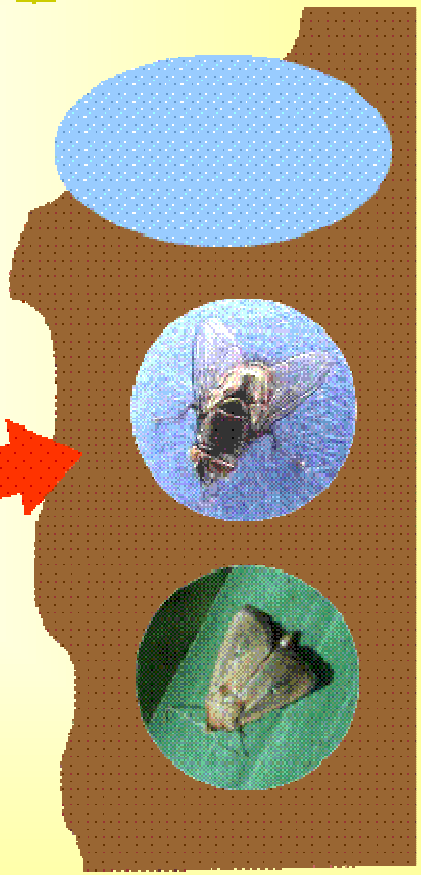
Recapture grids

(based on point source releases)

- Transsect, rectangular or ‚Wagon wheel‘ design
- extend it far enough
- sufficient number of recapture points
- locate recapture points at uniform distances
- Trap type needs to be adapted
- Correct for directional effect

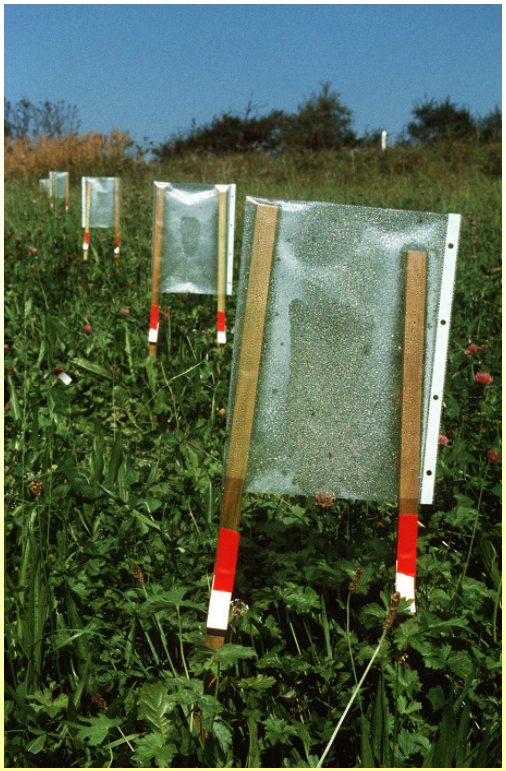
Example
Trichogramma

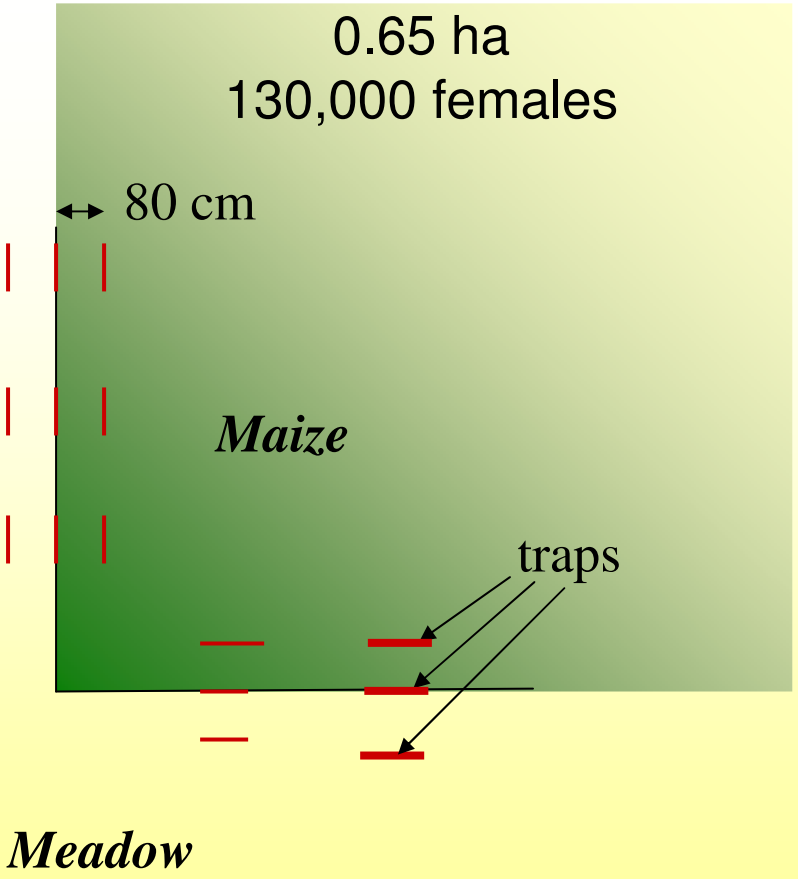




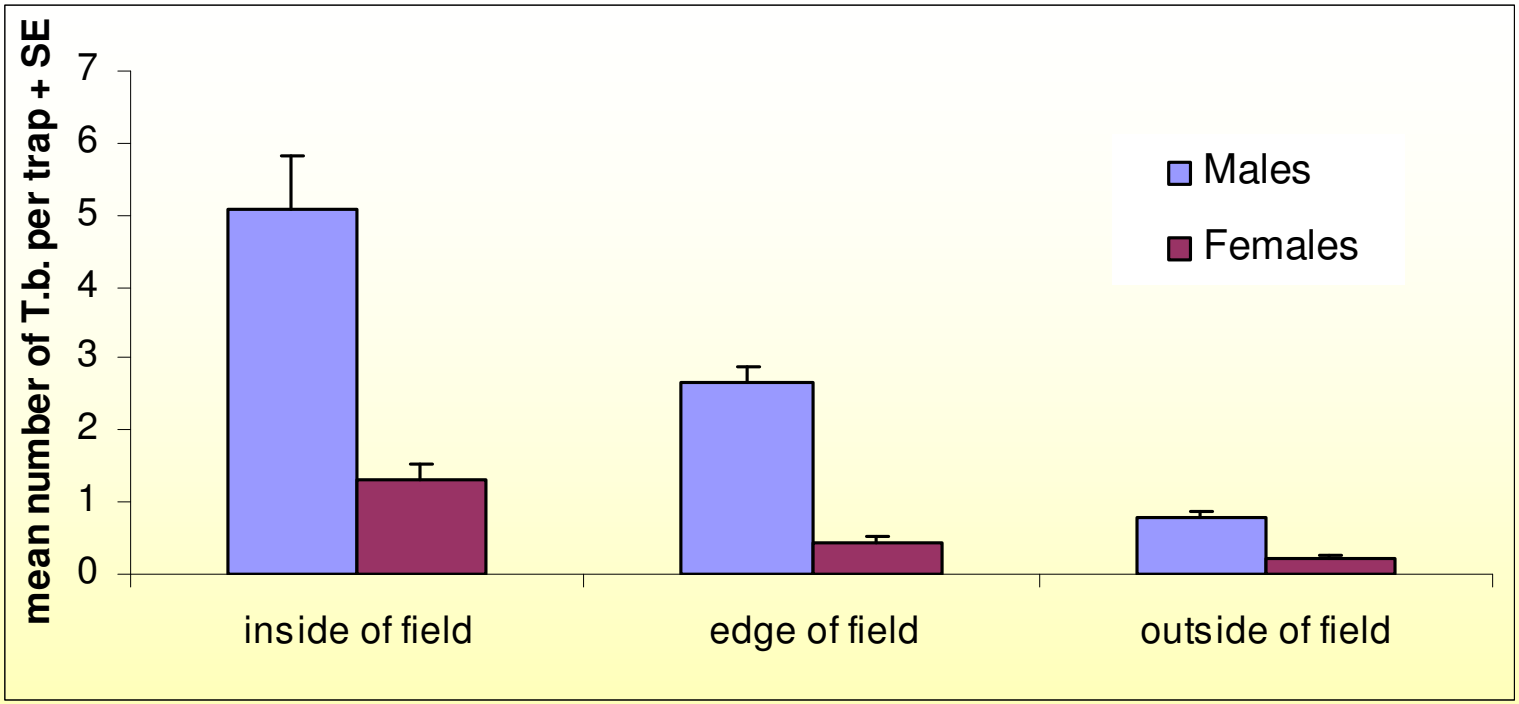
1. Dispersal out of the maize

Traps (n = 120)
installed for 1 week





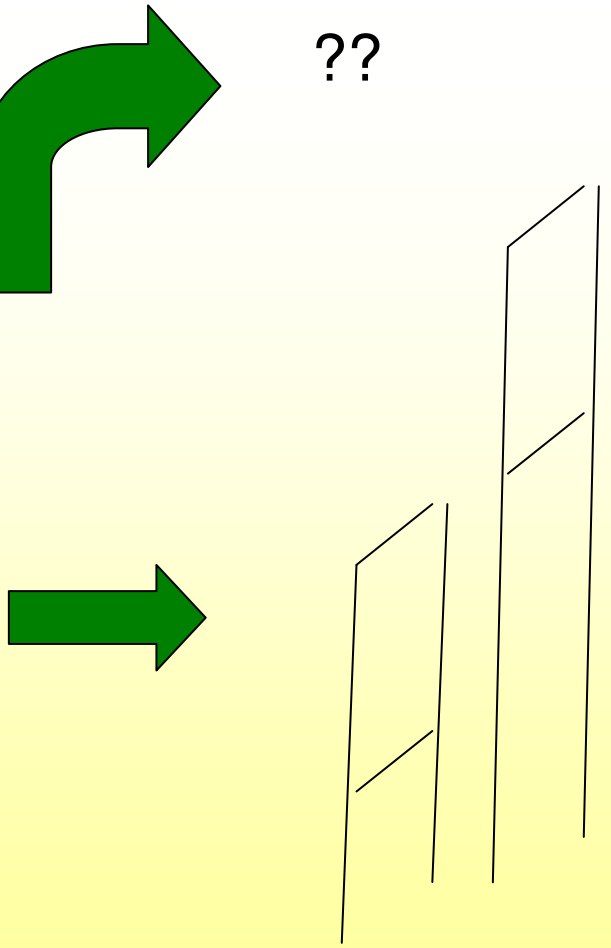
Dispersal out of the maize



→ Only a small proportion of released wasps do leave the field
Difficult to conclude on exact numbers

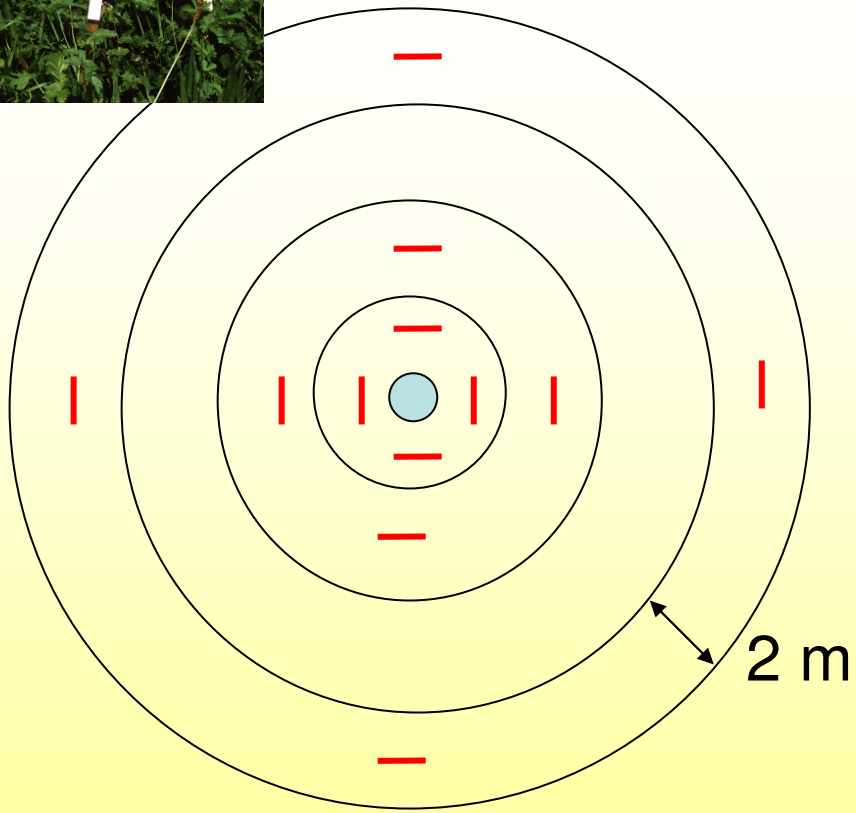
Position of trap important

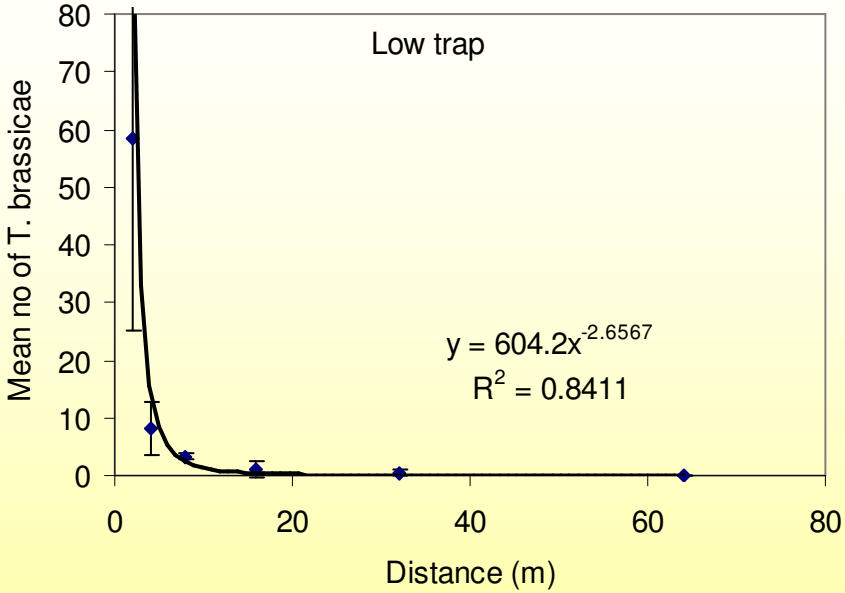
??



2. How far do they fly?

Distance travelled per day?





Original data from day 1

Point source releases (100,000 adults),
Wagon wheel design

Calculation

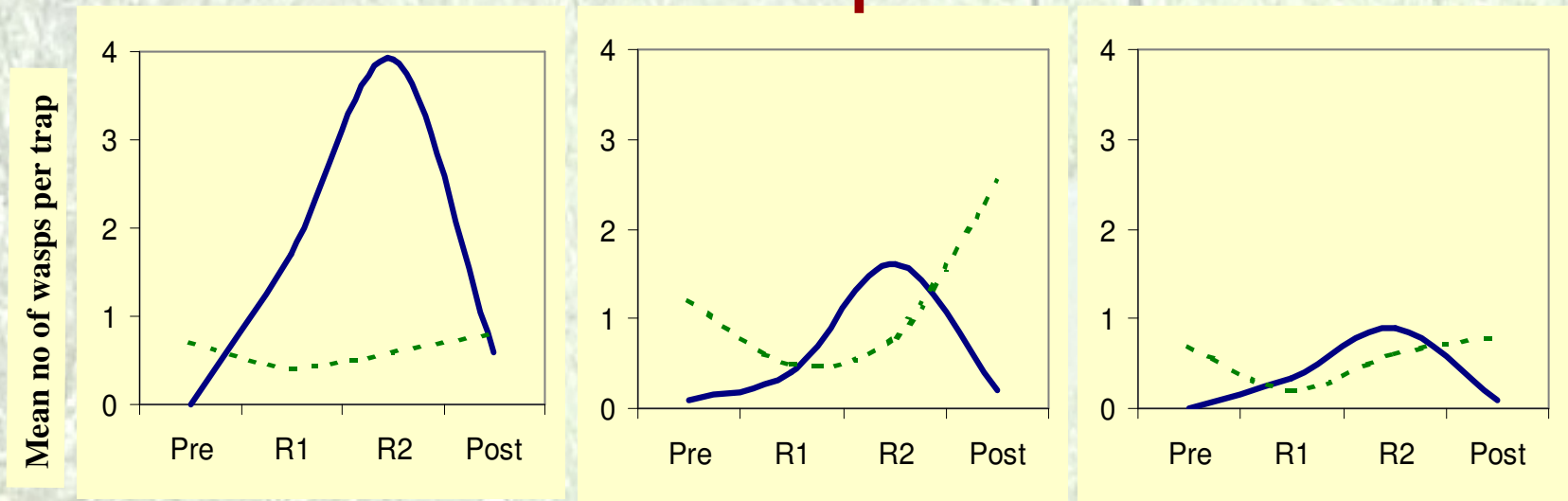
- Several methods available (standard distance, exponential model, diffusion model)
- In our case: mean dispersal a few m per day, less than 10 m during lifetime (1. generation)


A slightly different approach:
measure distribution over time in target
and non-target habitat
(more of a monitoring approach?)

Maize

Wildflower strips

Reeds



Released *Trichogramma brassicae*

Native *Trichogramma* population

Summary/Conclusions

- Dispersal important mostly for those exotic bca‘s where establishment is not expected
- We need to know: ‚numbers and distance‘ or ‚how many – how far‘!
- Methods are available to measure distance moved, but less so to measure the amount leaving target habitat
- Environmental conditions and habitat can be important (replicates are recommended!)
- Large uncertainties unavoidable?
- Difficult to obtain good data in addition to ‚common knowledge‘
- Dispersal studies are laborious (and thus costly)

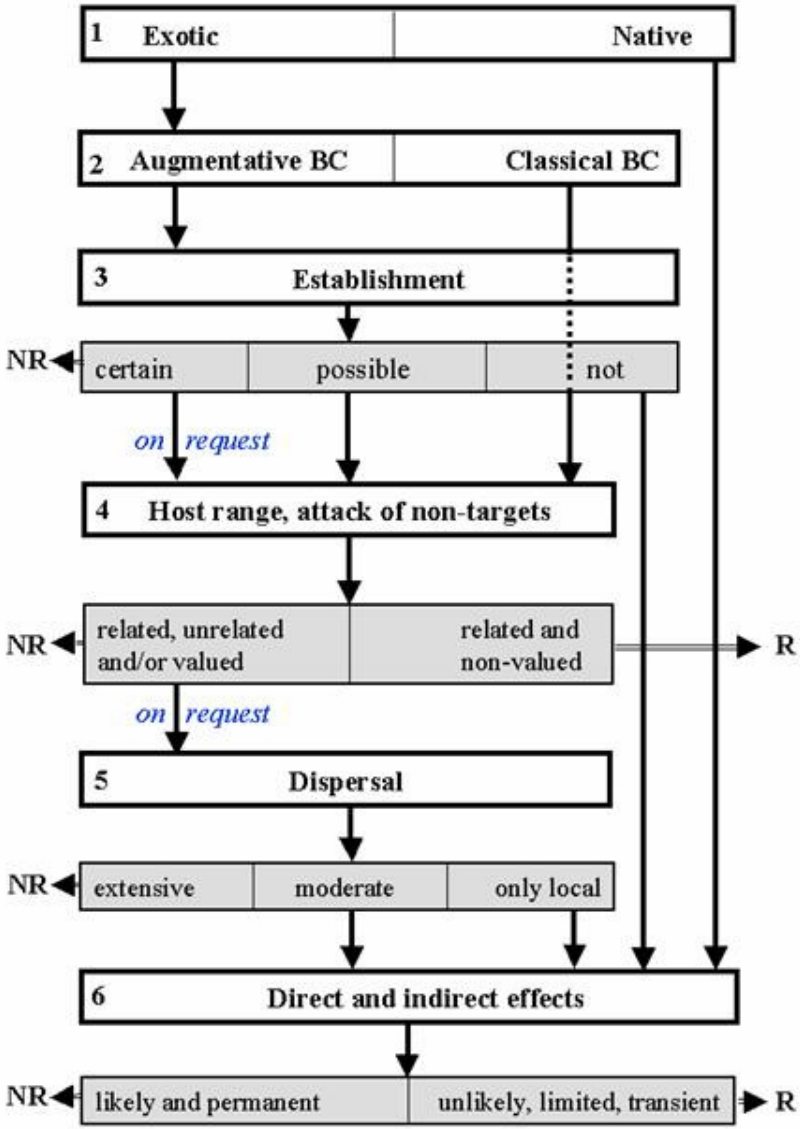
Thank you!

Mills, N.J., Babendreier, D., Loomans, A.J.M. (2006)

Relevance and feasability of parameters for environmental risk assessment

Factor	Important?	Feasable?
Establishment	Yes*	Yes (labourious)
Dispersal	Rarely	difficult, labourious
Host range	**Yes**	yes, labourious
Direct effects	??	difficult, labourious
Indirect effects	????	Very difficult, labourious

* For inundative agents only


1 Exotic
Native
2 Augmentative BC
Classical BC
3 Establishment
NR
certain
possible
not
on request
4 Host range, attack of non-targets
NR
related, unrelated and/or valued
related and non-valued
R
on request
5 Dispersal
NR
extensive
moderate
only local
6 Direct and indirect effects
NR
likely and permanent
unlikely, limited, transient
R

Trichogramma releases