

# Biological Control of *Hylobius abietis* in Irish Forests

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# The large pine weevil

- *Hylobius abietis* is the most economically important insect pest of re-forestation in Ireland.
- First recognised as a problem in Ireland in the early 20<sup>th</sup> century.

# *Hyllobius abietis* life cycle

- Larvae develop, feed and pupate under the bark.



- Adults emerge 18 – 36 months after oviposition.



# *Hyllobius abietis* – The problem

- Populations greatly increased by modern forestry practices.
- Large clearfells of conifers release volatiles that can be detected over long distances by weevils.
- Sites are replanted with seedlings.

# *Hyllobius abietis* – The problem

- Emerging adults on replanted sites feed on the bark of young seedlings.
- The damage sustained can kill up to 100% of a seedling crop without chemical control.
- Currently alpha-cypermethrin is used to control weevil populations.

# Entomopathogenic nematodes

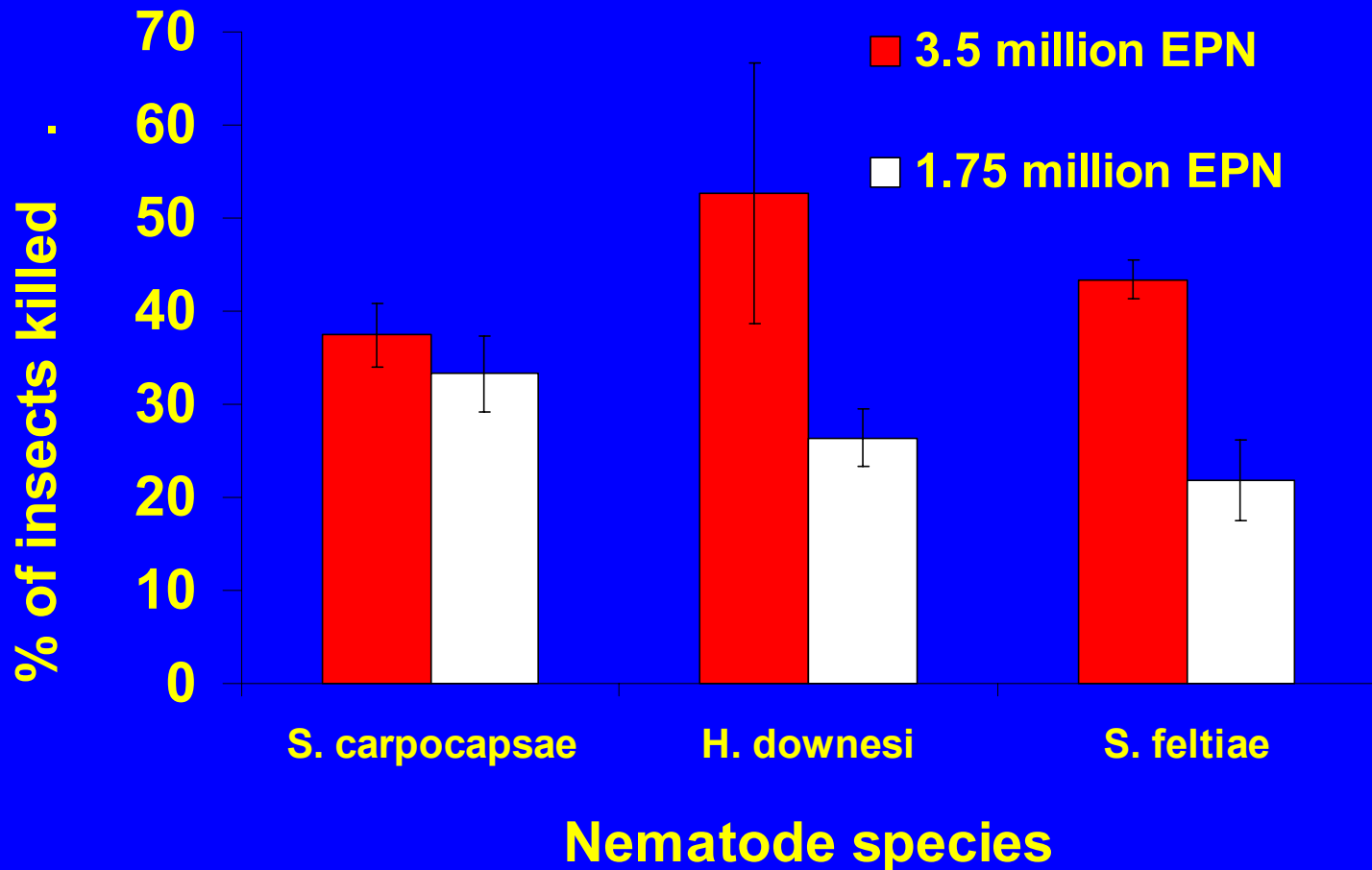
- Entomopathogenic nematodes (EPN) are thought to have potential to reduce *H. abietis* populations to manageable levels



# Field trials

- Carried out annually since 2001
- 2005 trials are currently in progress
- Aim to test different strains and species of EPN against *H. abietis*.

# 2004 Field trial results



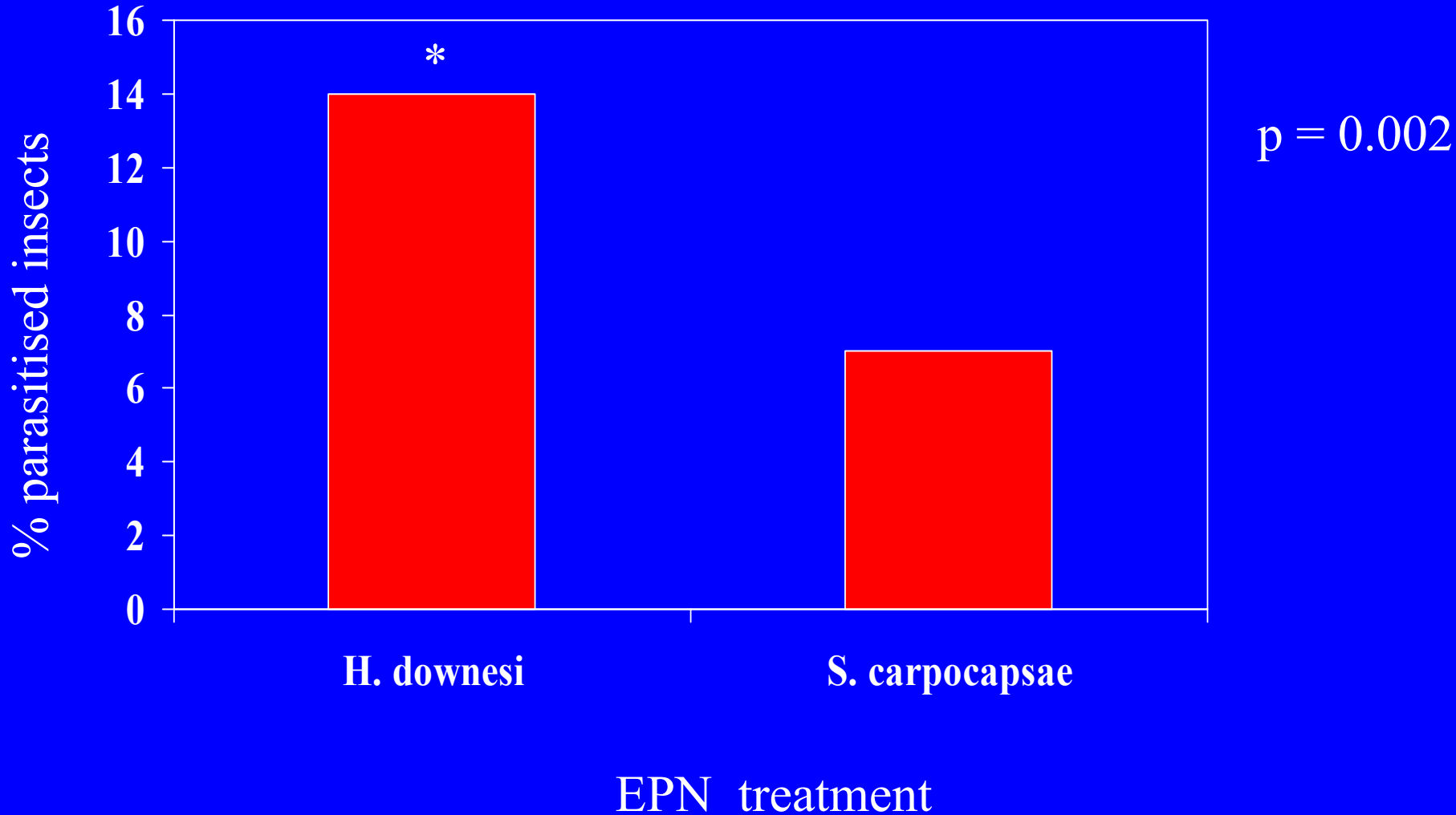
# Some field trial findings to date

- *H. downesi* is the most effective species of EPN we have tested to date.
- *H. abietis* populations can be reduced by up to 95% by application of EPN.
- Persistence of EPN is at low levels in replanted forests after 36 months.

# Field trials in spruce forests

- Trials of EPN in control of *H. abietis* and interactions with fungi and a parasitic wasp, *Bracon hylobii*.
- Stump degrading and entomopathogenic fungi.

# EPN trials in spruce



# Fungi trials

- Applications of stump degrading and entomopathogenic fungi.



# Bracon hylobii

- Oviposits through bark onto weevil larvae.
- Parasitism was not affected by EPN.
- Mean of 22% parasitism of *H. abietis*.
- No evidence of infection by EPN.

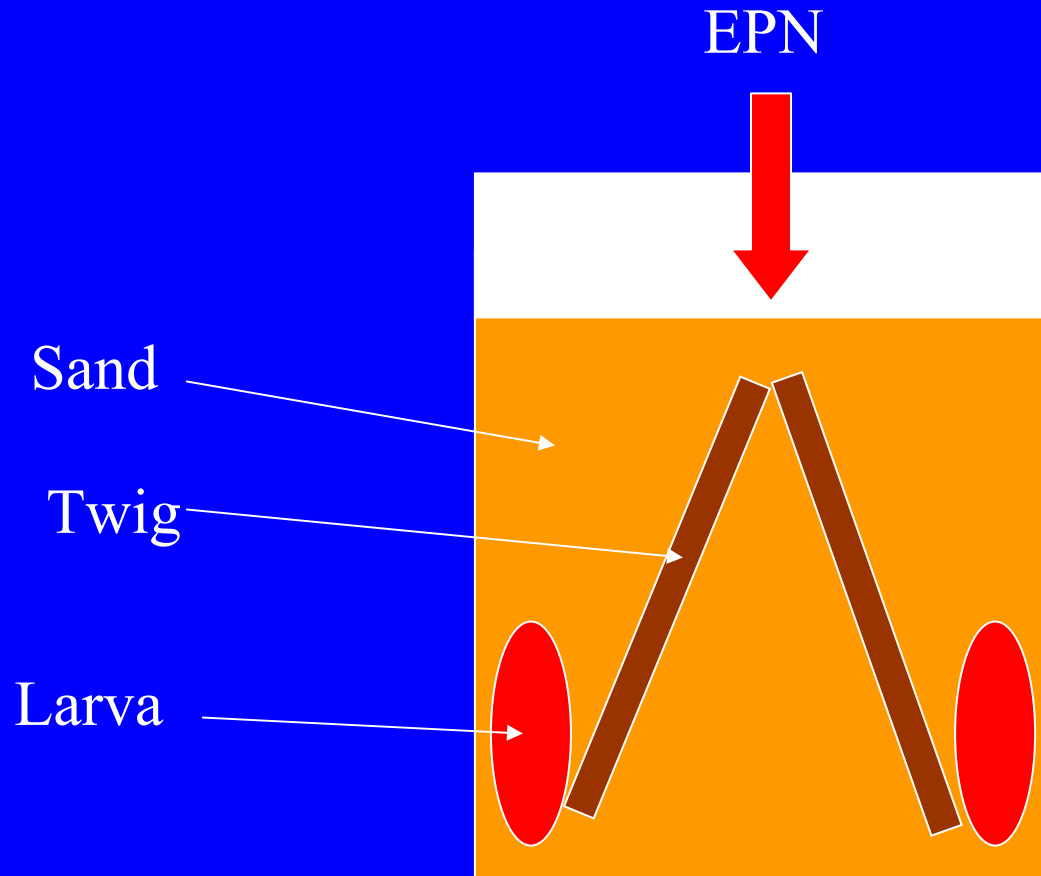
# Lab experiments

- Entompathogenic nematode reactions to feeding versus non-feeding weevil larvae.
- Effect of EPN on adult weevil feeding.
- Susceptibility tests of weevil larvae, pupae and adults to EPN.

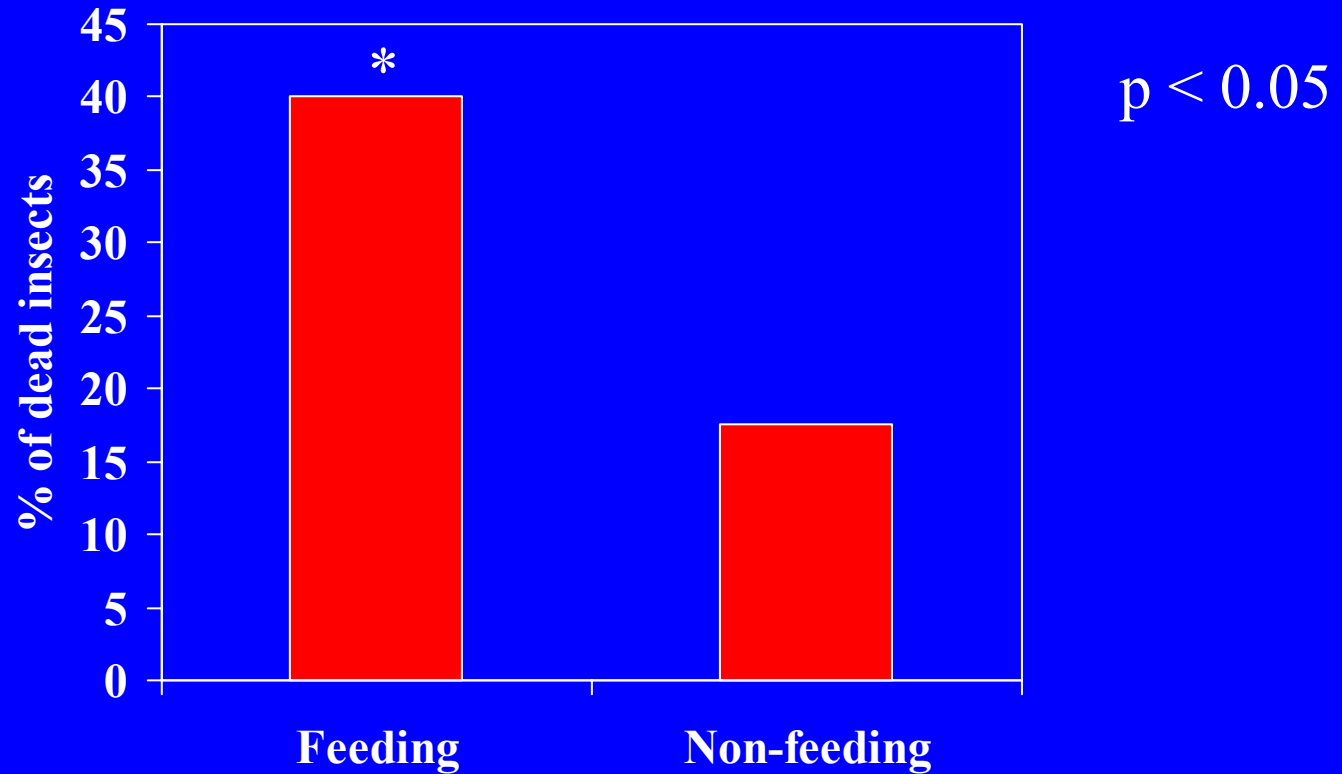
# Nematode attraction to weevils

- Has been suggested that EPN are primarily attracted to chemical host cues.
- Chemical cues do not travel well in peat soils.
- Possible that vibrations generated by the feeding insect are the primary host cue.

# Does host feeding affect infection by EPN?



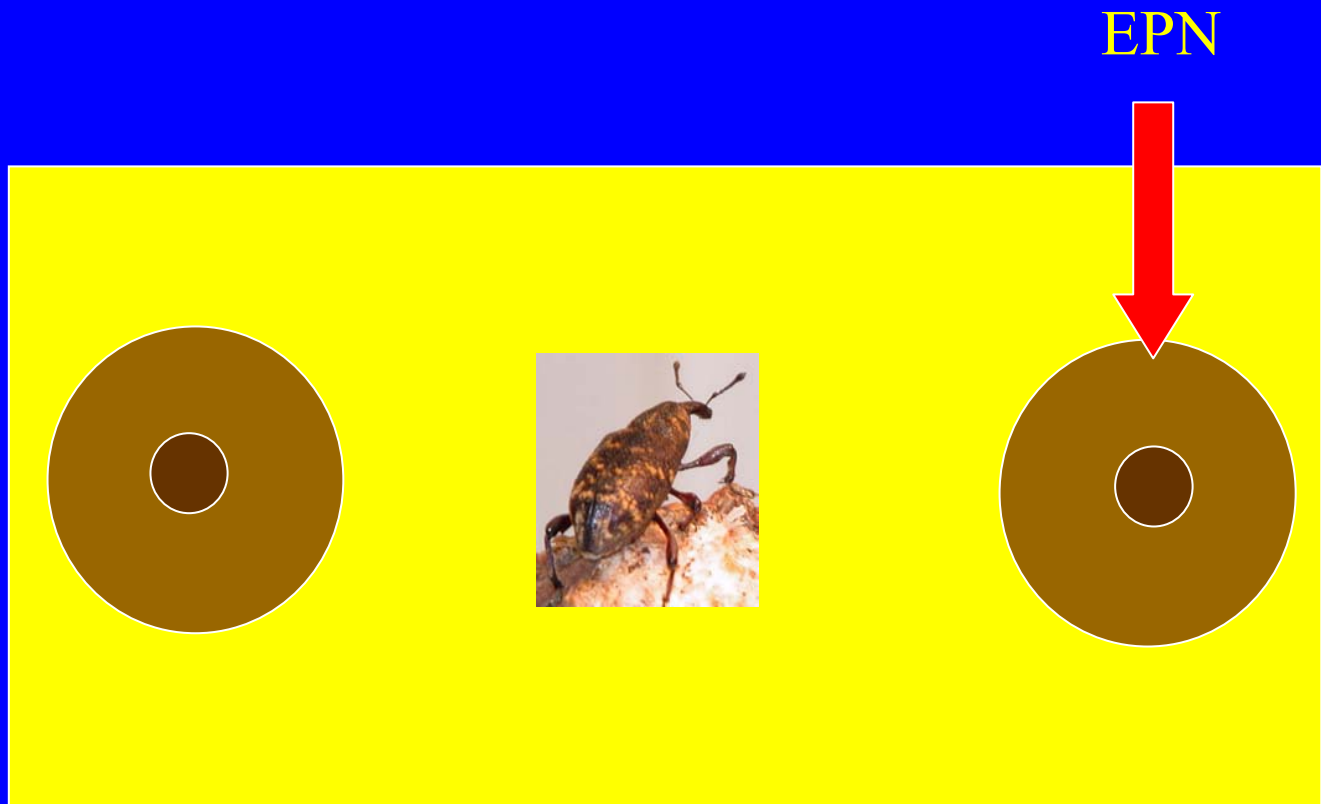
# Results



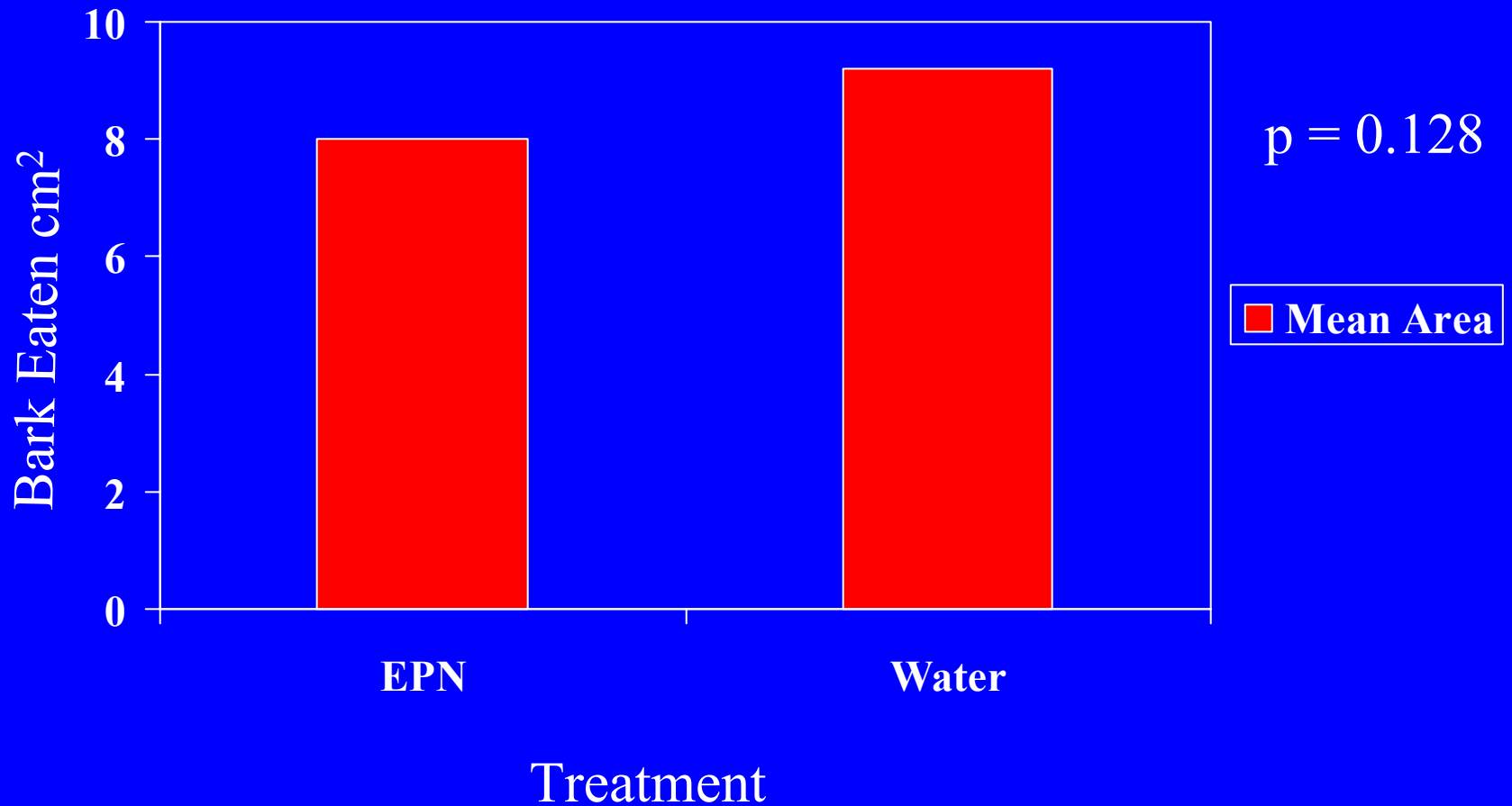
# Results

- Feeding insects that were killed were invaded by more EPN than non-feeding insects, average of 5.3 and 2.7 IJs respectively.

# Do EPN repel adult weevils?



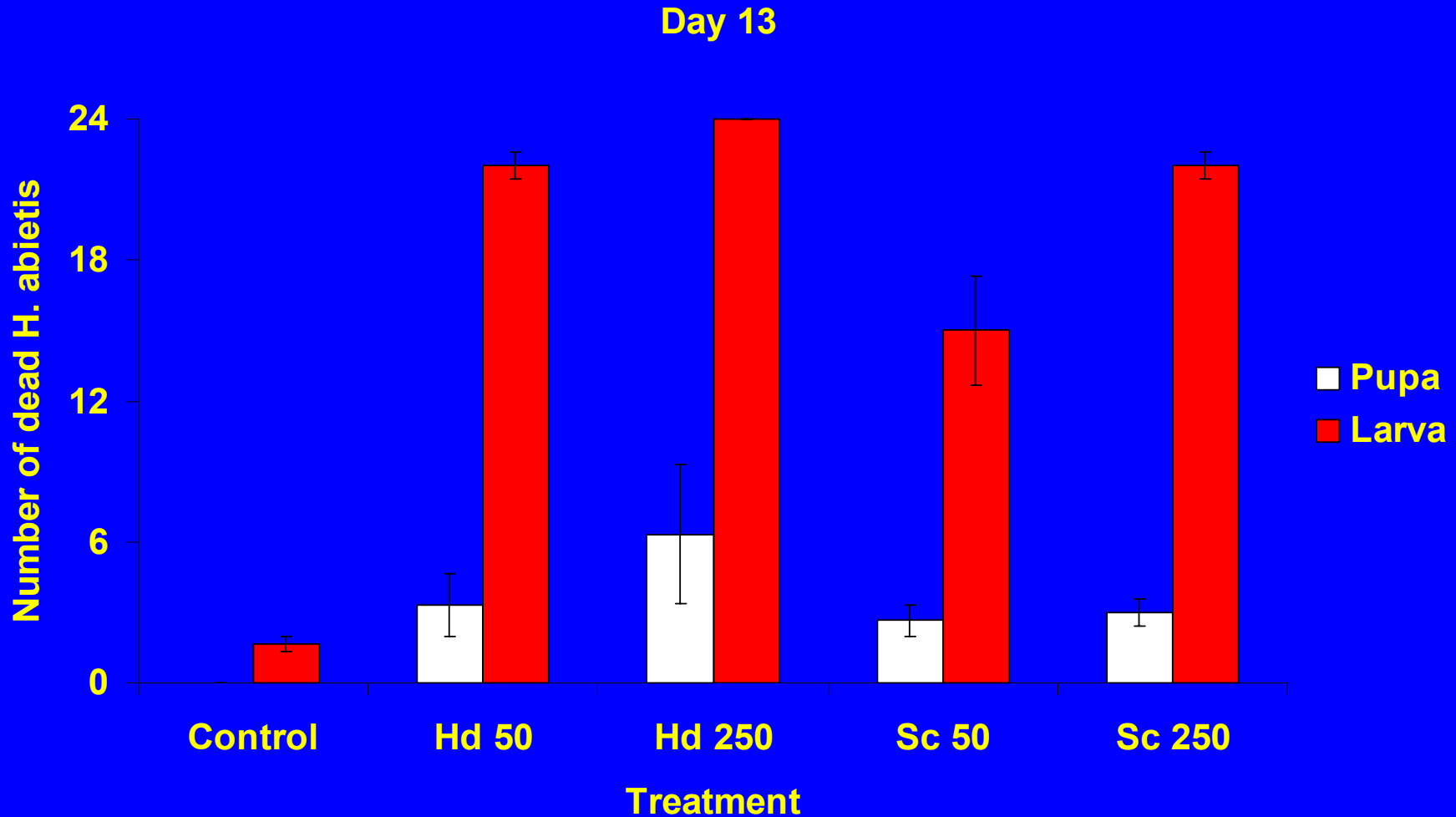
# Results



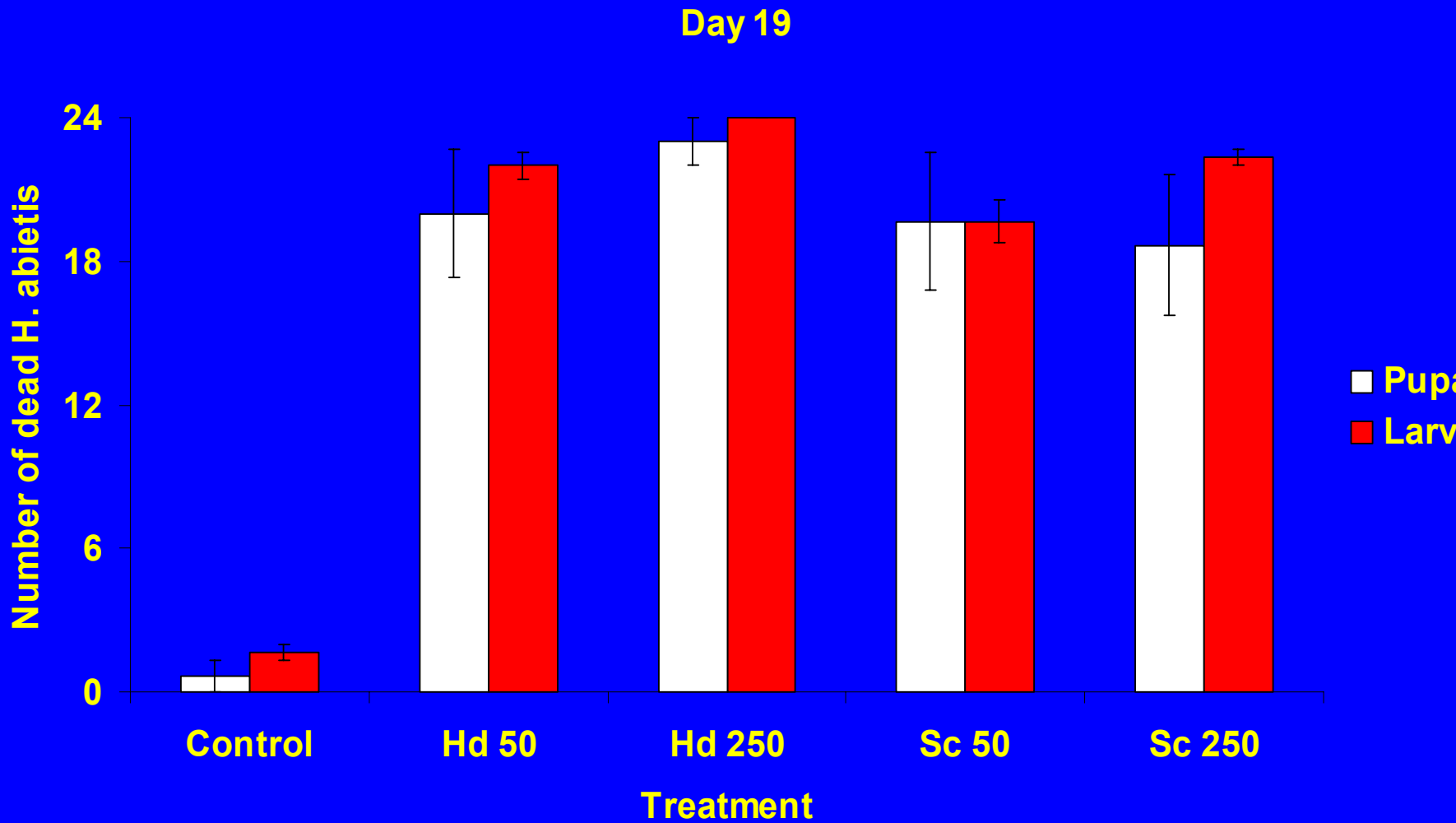
# Which is the most susceptible life stage?

- Susceptibility of the various weevil life stages to EPN.
- Help to time application of EPN for most effective control
- Currently in progress

# Preliminary results



# Preliminary results



# What about adults?

- Thought that adults have a high resistance to EPN.
- Preliminary results suggest that at higher dose of 250 EPN adults can be susceptible.
- Currently in progress.

# Acknowledgements

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