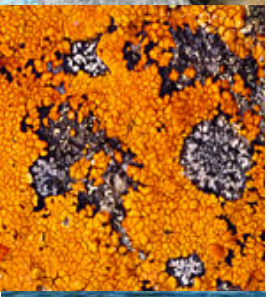
The Noah's Ark problem: What species are important?





Forest management: Why the beetles, moths and other little creatures matter

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Department of
Environment and Conservation

WA forests are managed ecosystems

Draft forest management plan 2014-2023

- Key performance indicator 3: The conservation of selected biodiversity groups in areas subject to timber harvesting.
- Performance measure: Species richness and abundance of selected biodiversity groups.
- Performance target(s) Species richness and abundance of selected biodiversity groups in the matrix within which timber harvesting is undertaken not to be negatively impacted by management activities.

Biodiversity

The arthropods have it!

1.3. The diversity of life shown as proportions of named species.

From
Grimaldi and Engel (2005)

Biodiversity

Velvet worms: Kumbadjena sp.

Spiders

Crickets

Crickets

Bees

Bees

Ants

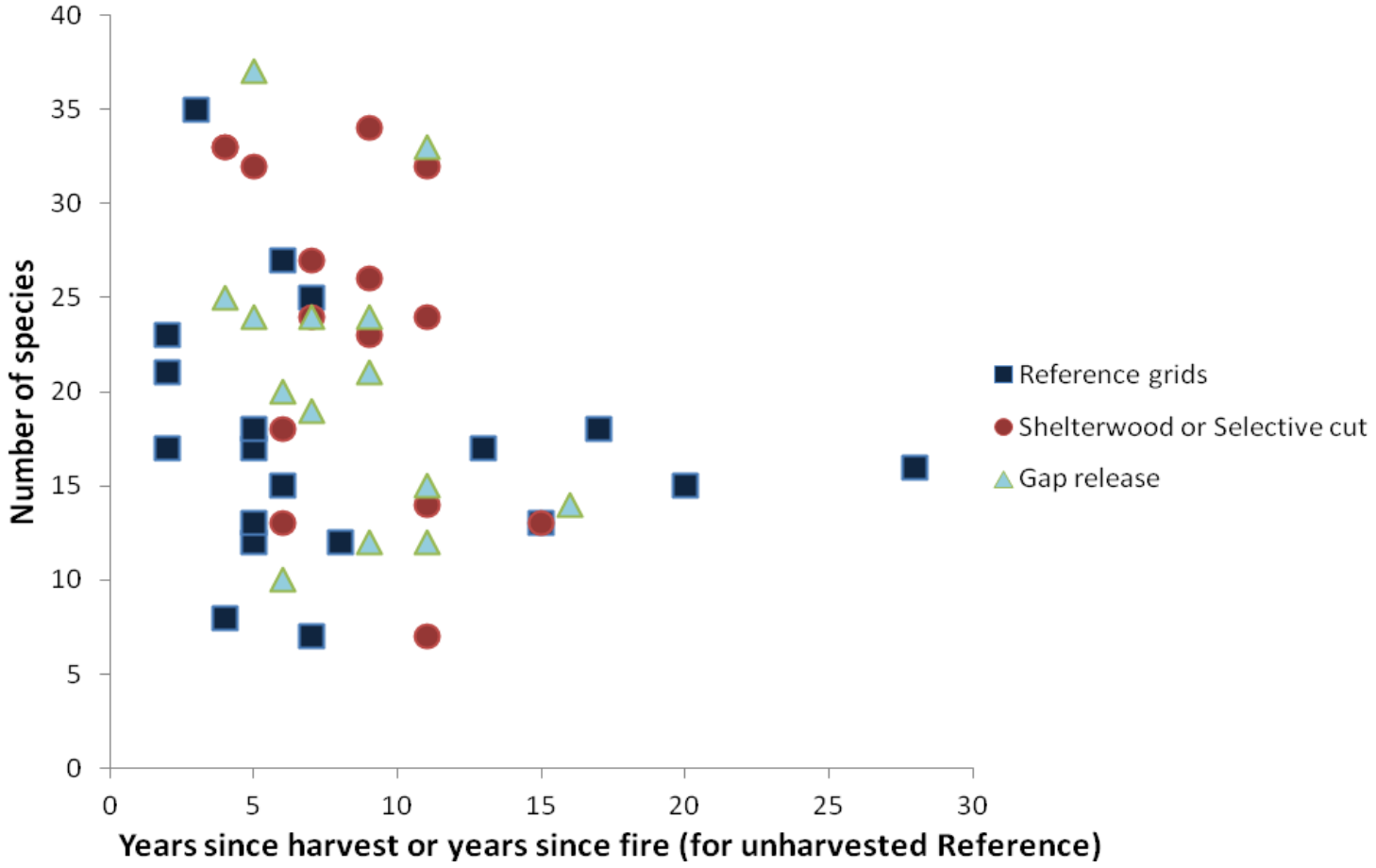
Beetles

Moths

Send in the entomologists and get some samples

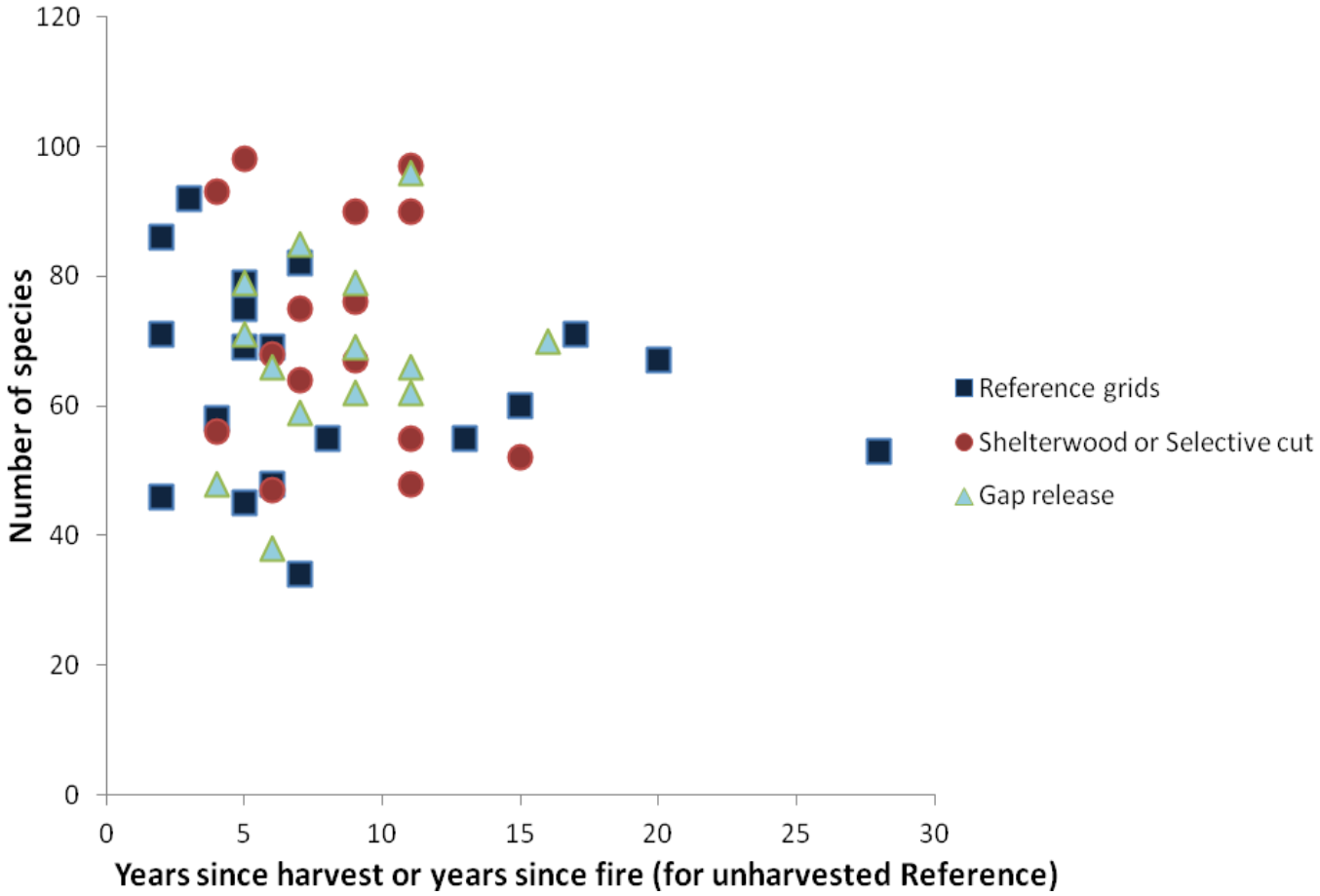
Beetle species richness and jarrah forest management

- *Taxonomic diversity of beetles*

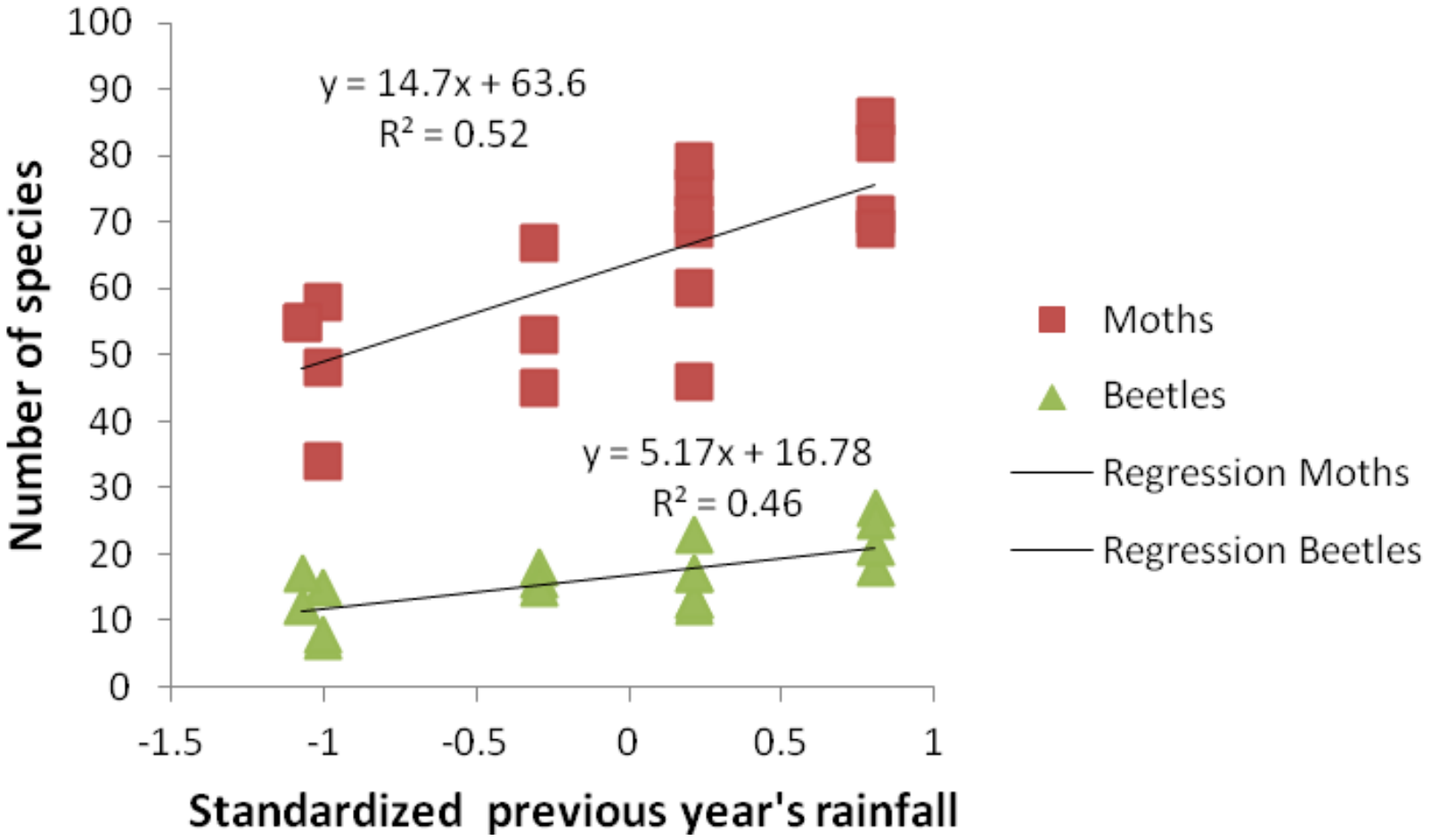


Moth species richness and jarrah forest management

- *Taxonomic diversity of moths*



Sampled numbers of beetle species and moth species respond to rainfall



Functional groups: The tomb of the First Qin Emperor

- *There are many functional roles in the Imperial retinue. Groups of figures represent the same functional role but each figure is unique.*
- *Images from various internet pages*

Beetle functional groups

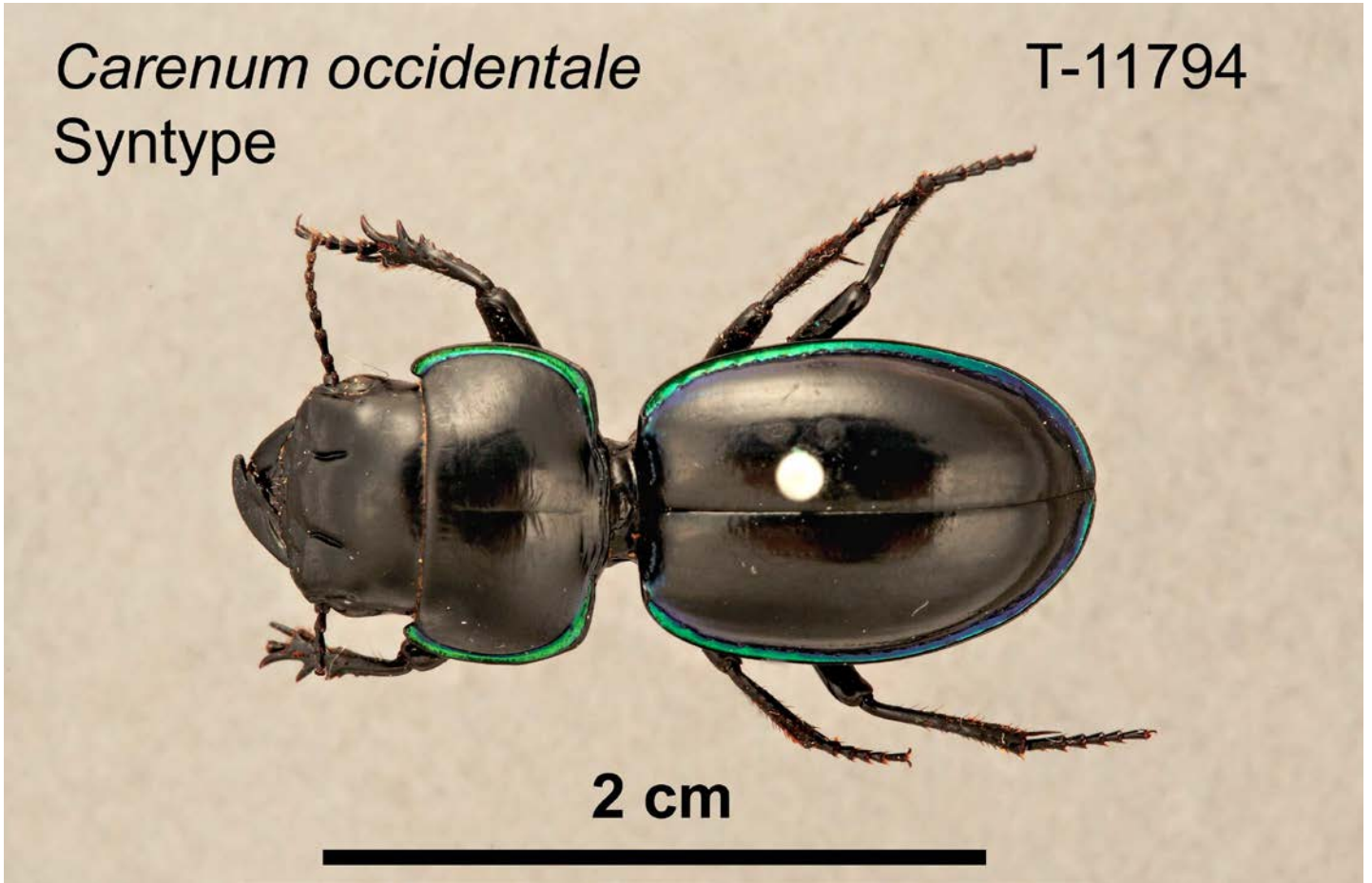
- *Predators e.g. Carabidae*

Calosoma schayeri
Image from
Australian Insect
Sales

Beetle functional groups

- *Predators e.g. Carabidae*

  Image from Museum of Victoria



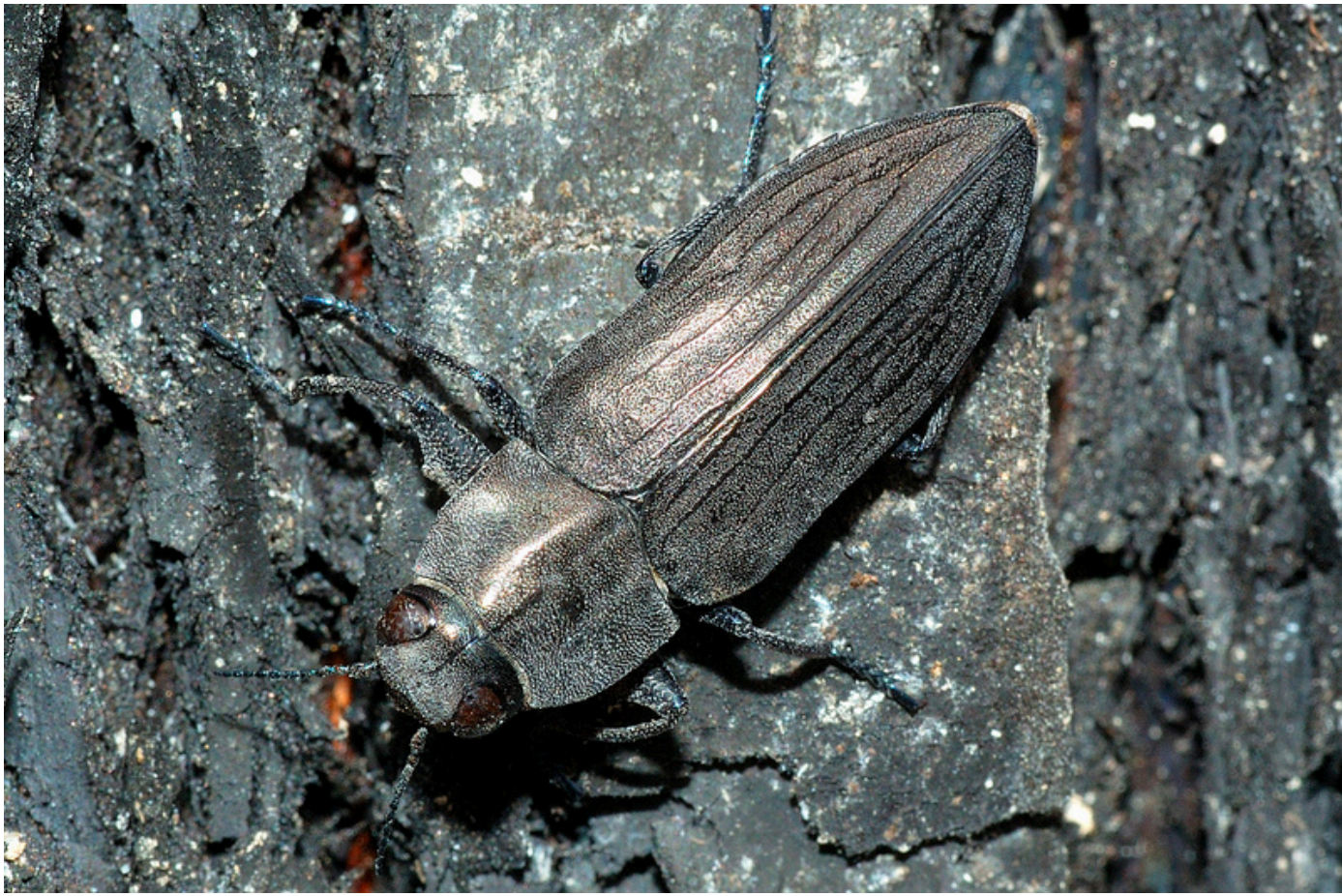
Beetle functional groups

- *Xylophages (wood eaters)*

Phoracantha impavida
Tuart borer

Beetle functional groups

- *Xylophages (wood eaters)*



Merimna atrata

Beetle functional groups

- *Herbivores (leaf feeders)*
  e.g. many adult weevils

Leptopius sp.
Image© Michael J. Barritt

Rhadinosomus lacordairei
Image© Lorraine Phelan

Moth functional groups

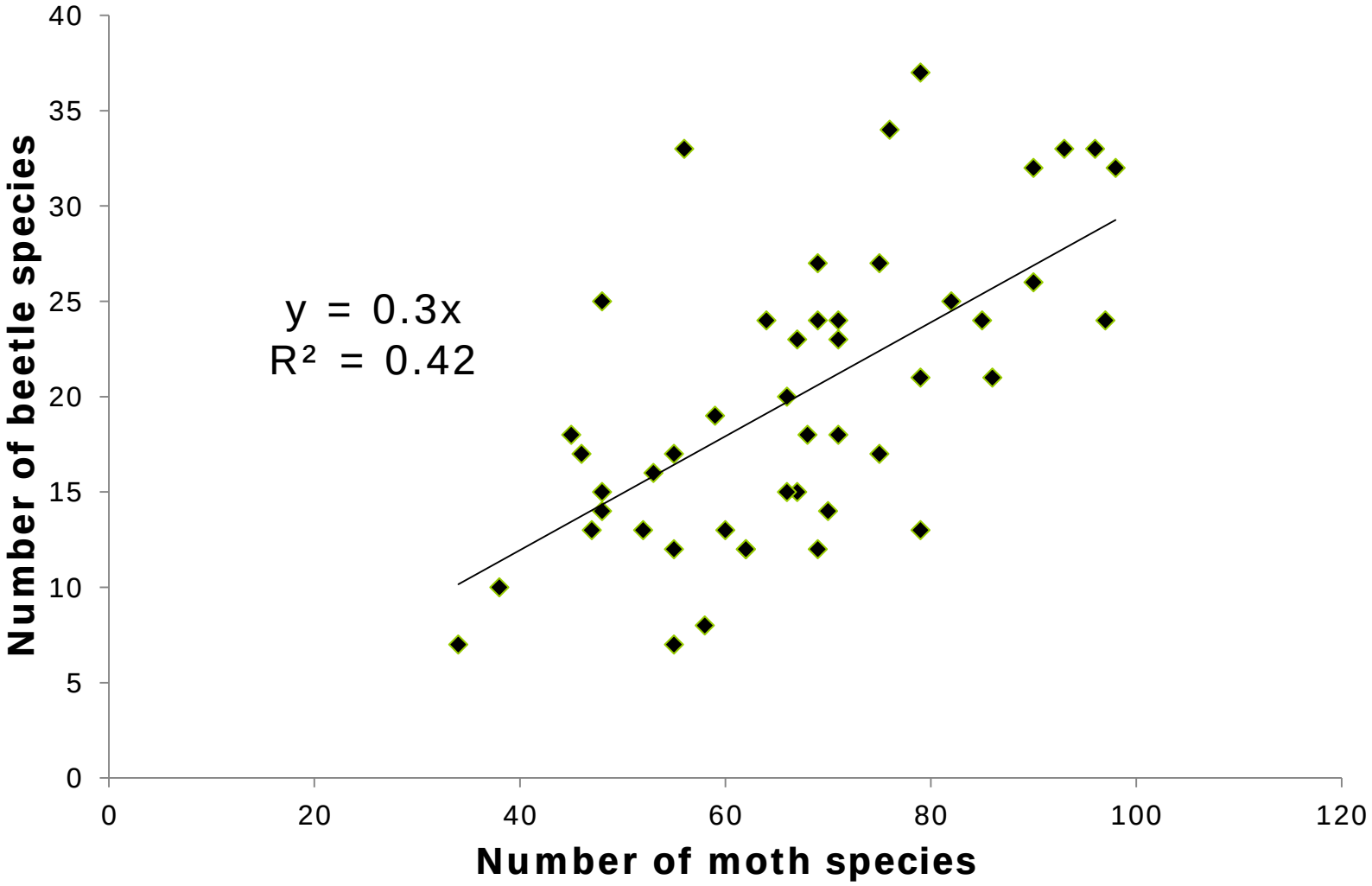
- *Herbivores (leaf feeders)*

Carthaea saturnoides
Image from Museum of WA

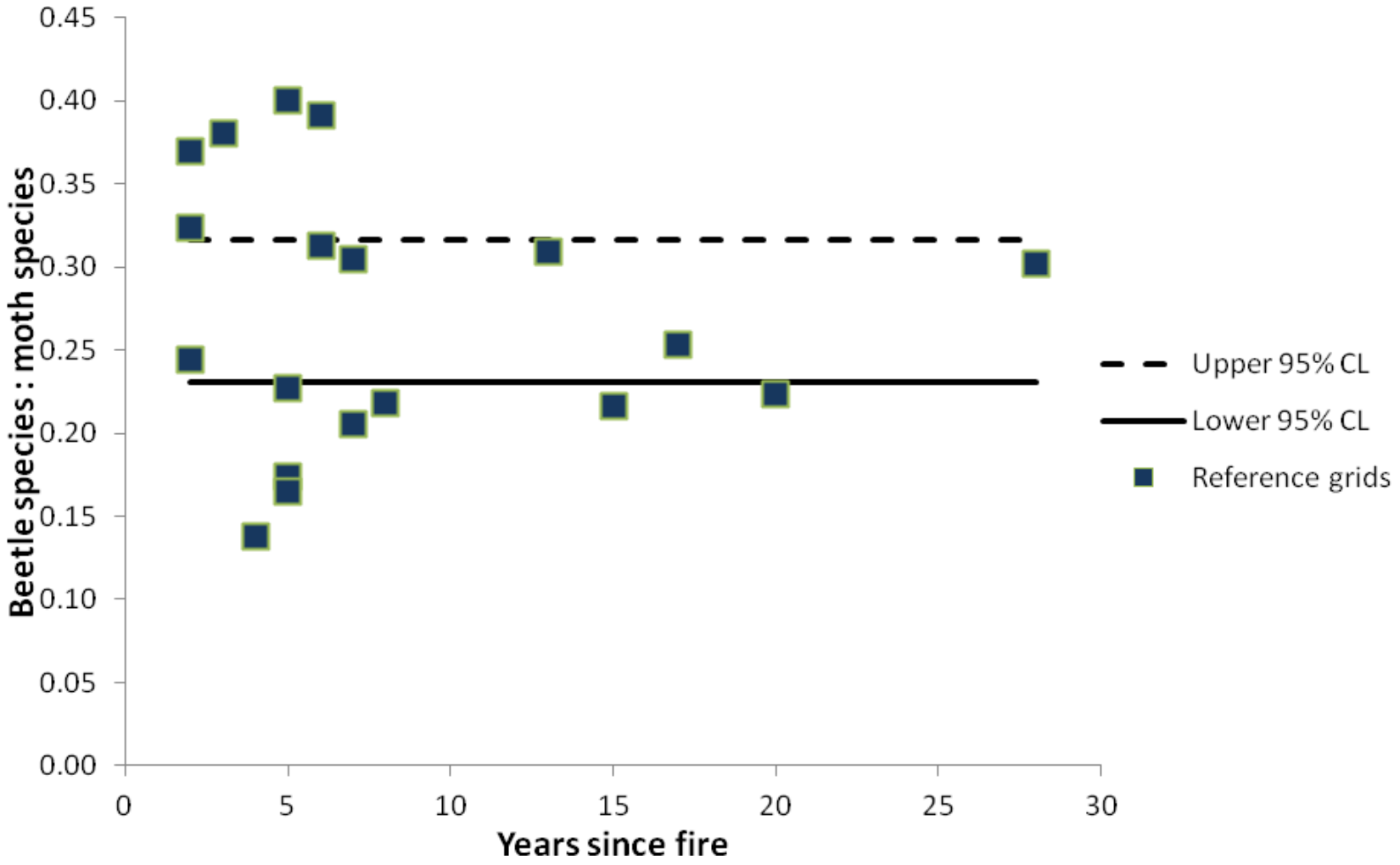
A thought experiment

- *Functional composition of insect faunas is affected by disturbance because some functional groups are favoured and some are disfavoured (eg Andersen (1995) Journal of Biogeography 22, 15-29)*
- *Moth and beetle faunas have different compositions of functional groups*
- *Hypothesis: The ratio of beetle species to moth species will be changed by disturbance*

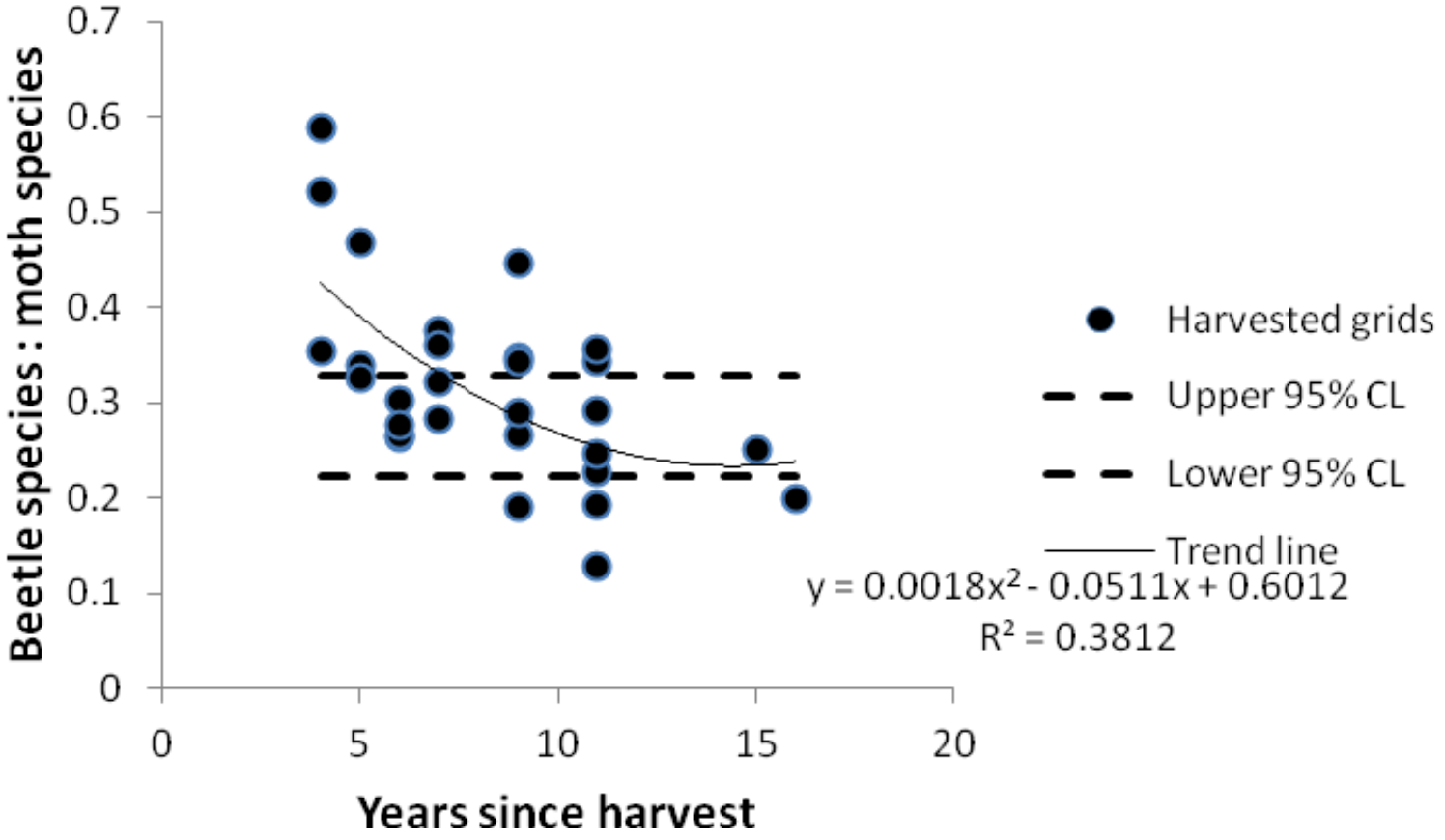
Relationship between number of moth species and number of beetle species



Ratio of Beetles:Moths and fire age in unharvested sites



Ratio of Beetles:Moths and regeneration age in harvested sites



Forest management: Why the beetles, moths and other little creatures matter

- The relative functional group abundance and diversity in invertebrate assemblages is related to the state of ecosystem processes.
- Forest ecosystem processes may be affected by forest management activity
- Changes in abundance and diversity of functional groups can indicate the magnitude and duration of effects, and hence sustainability, of forest management activities