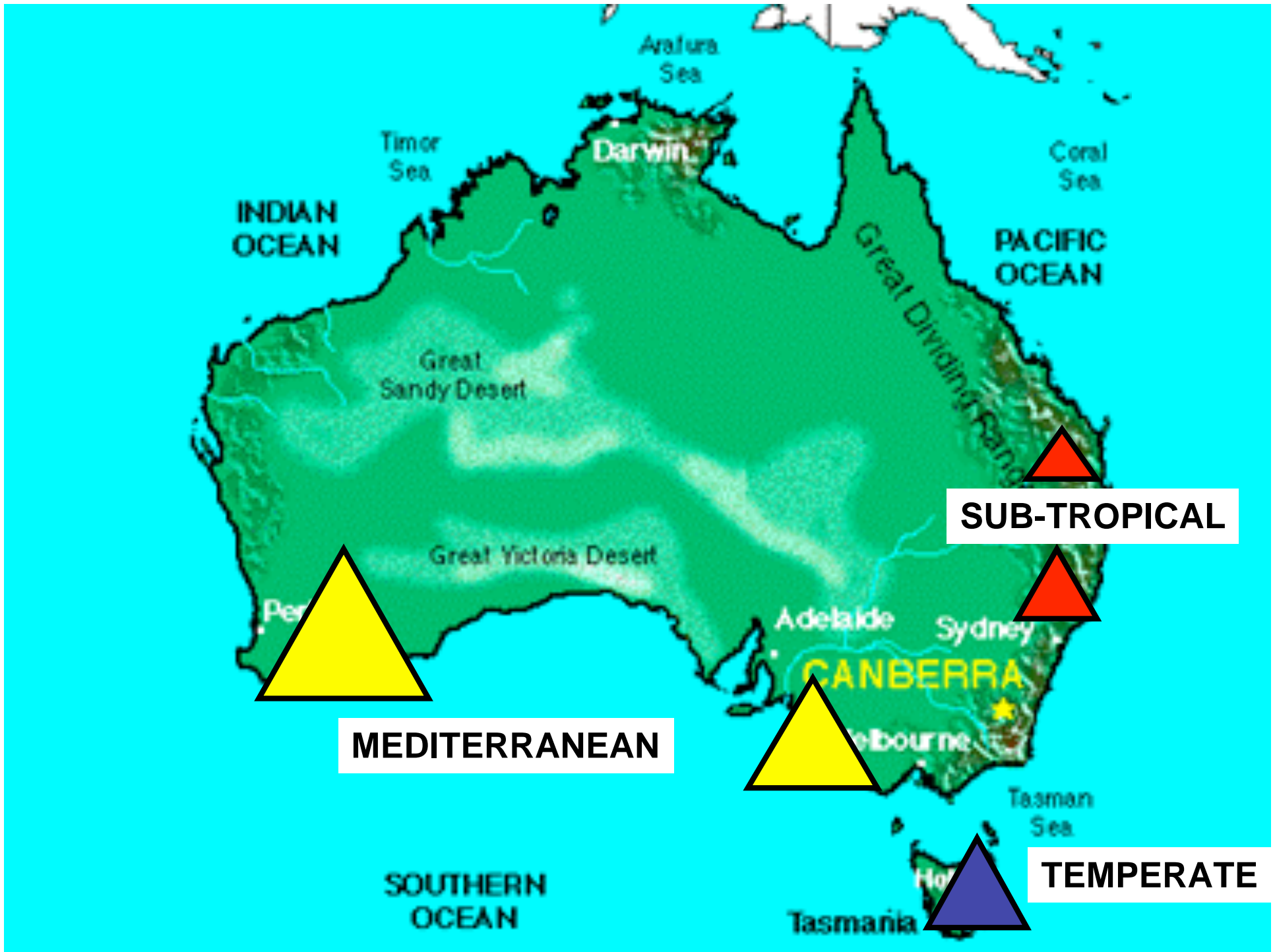




Molecular phylogenetics and phylogeography of the cryptic species complex *Gonipterus scutellatus* (Coleoptera, Curculionidae)

Tendai Mapondera
Mamuru Matsuki
Treena Burgess





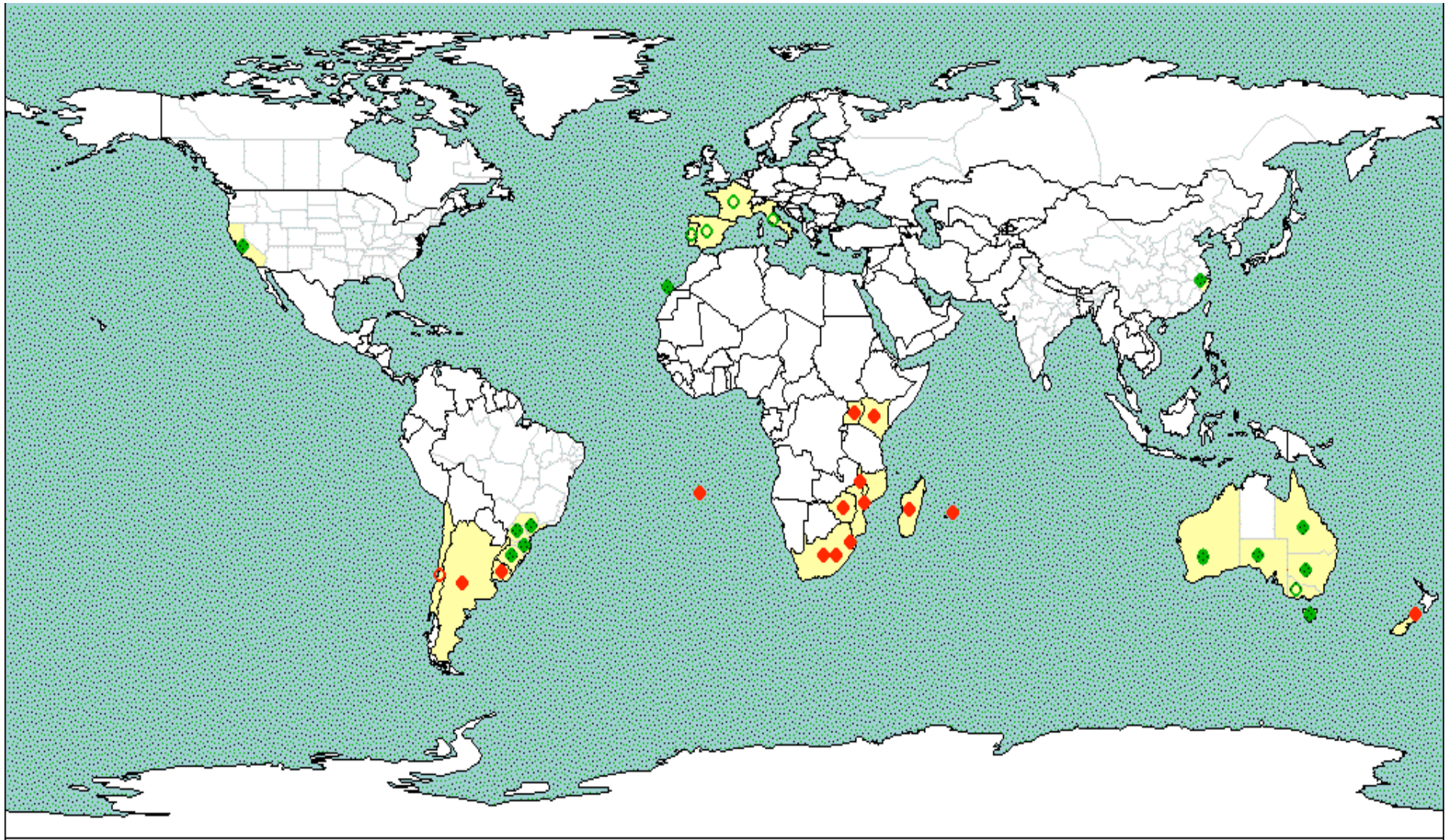
SUB-TROPICAL

MEDITERRANEAN

TEMPERATE







Adapted from (CABI/EPPO, 1997)

Biological control of *Gonipterus scutellatus*

In 1926, a myriad *Anaphes nitens* was found which is a parasitoid of *G. scutellatus* eggs. Subsequent introduction of parasitoid into *G. scutellatus* affected areas has been effective biocontrol



However, in different microclimatic and ecological conditions there can be periodic fluctuation of the host and parasitoid populations leading to incomplete control. Thus, often require integrated pest management that uses both insecticide and *A. nitens*

Disparities in life history characteristics

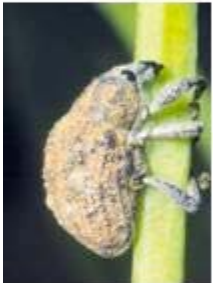
G. scutellatus has highly divergent host records with susceptible hosts varying between locations globally

In Western Australia, *A. nitens* is ineffective as a biological control of *G. scutellatus*, but is effective in other parts of Australia and the world

In Western Australia *G. scutellatus* undergoes one annual generation compared to two to four generations recorded in other parts of Australia and elsewhere

G. scutellatus in South Africa and Australia was reported as having a life span of up to seven months whereas in Spain, *G. scutellatus* has been reported to live up to twelve months

Discrepancies in host records, life cycle and variation in biological control among populations of an insect herbivore may be a result of a species complex being present with each species having its own host use pattern.



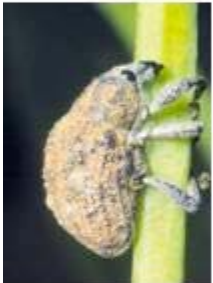
Aims of Study

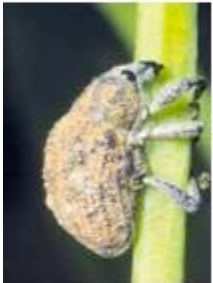
Anaphes nitens is ineffective as a biological control of *G. scutellatus* in Western Australia

WHY?

Is *G. scutellatus* in Western Australia a different 'variety'?

What is the diversity of *G. scutellatus* in WA?





1000+ individuals
collected from 59
plantations and native
remnants across range
in Australia

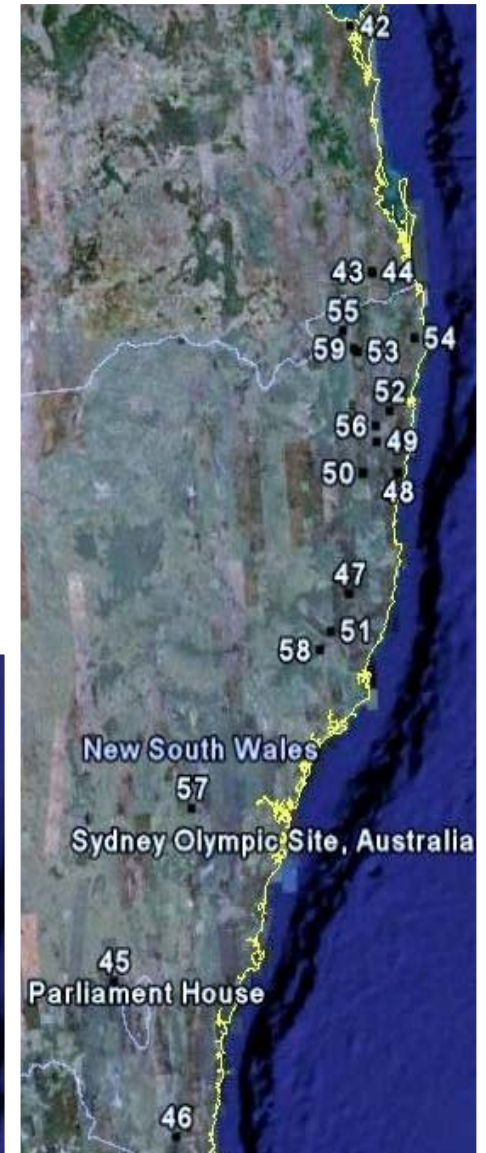
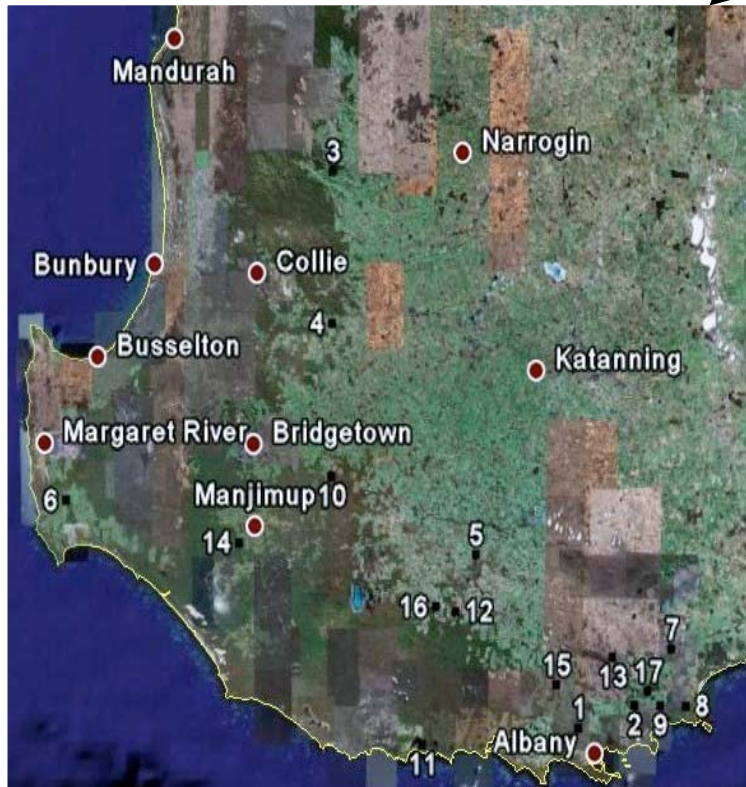
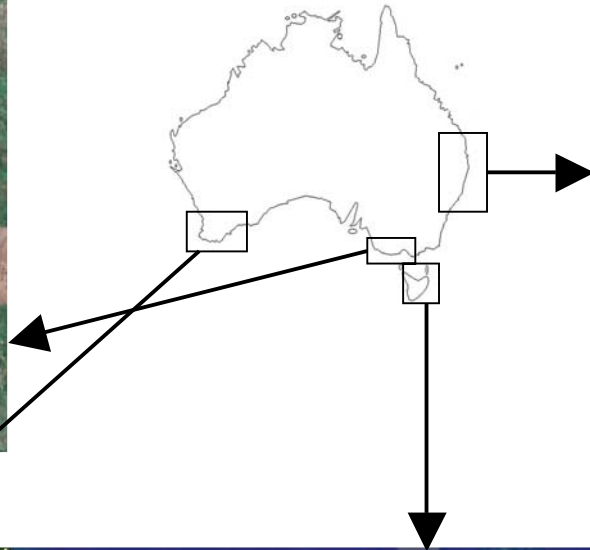
BODIES
Male genitalia
dissected

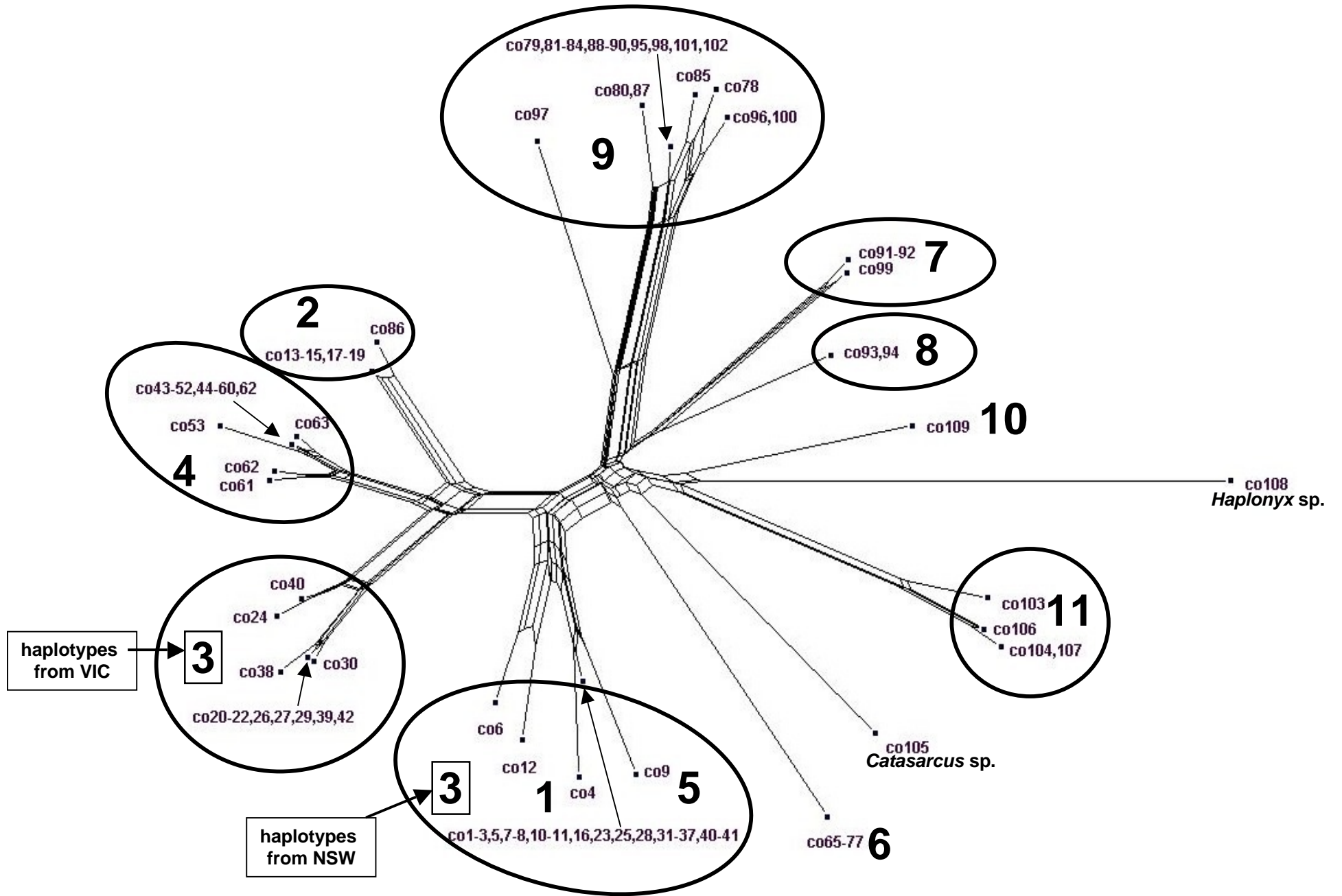
LEGS

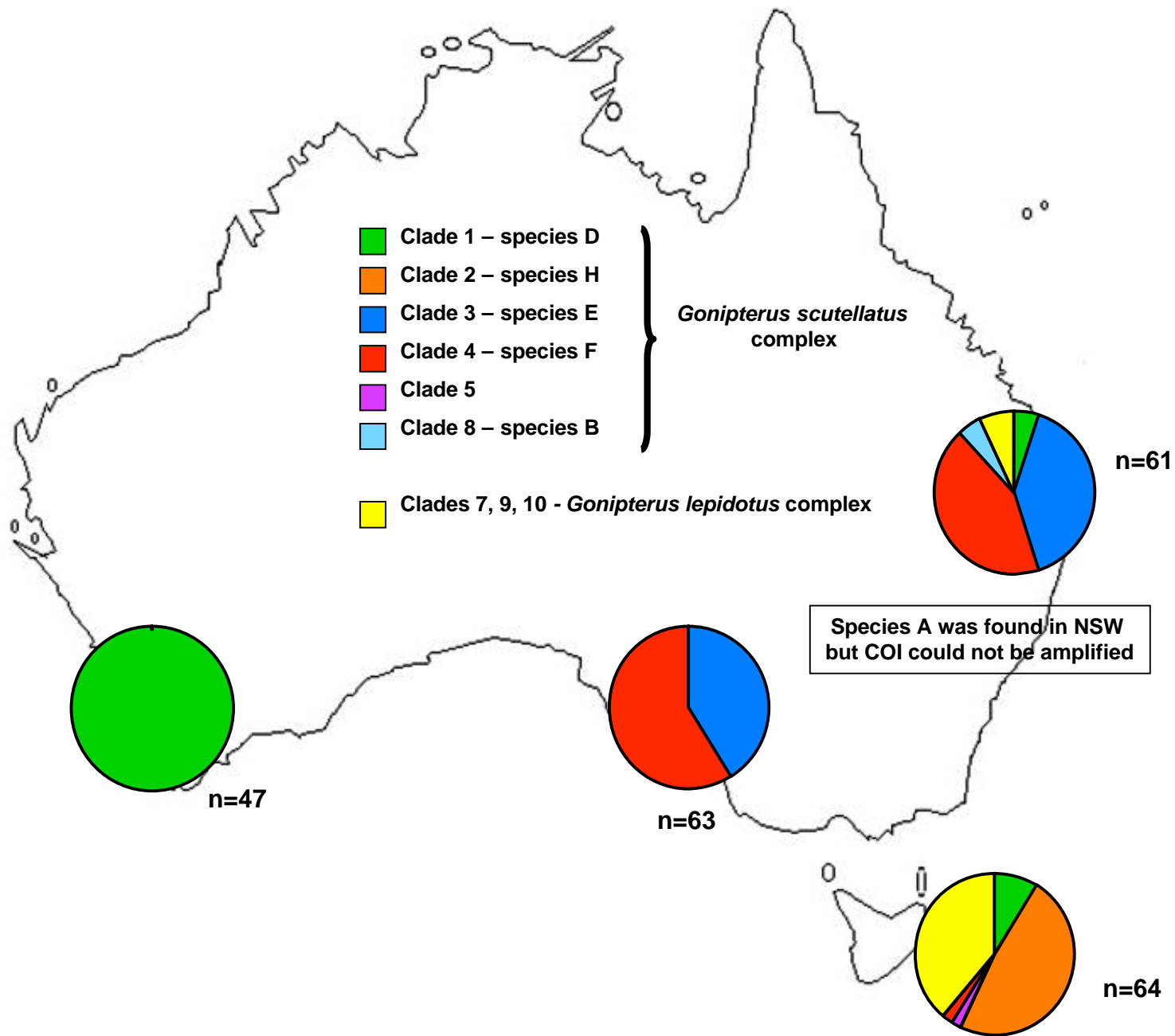
1. DNA extraction
2. PCR optimisation
and amplification
(275 individuals)
3. Sequencing

Identity confirmation
using Morphological
traits (Dr. Ralph
Oberprieler of
CSIRO Entomology)

Phylogenetic analysis
using mtDNA
Cytochrome oxidase 1
(COI) and also nuclear
genes, elongation
factor 1 alpha (EF1- α)
and LSU







Implication of this study

The morphological observations that *G. scutellatus* is not one species but a species complex is supported by phylogenetic analysis using sequence of mtDNA Cytochrome oxidase 1

A single COI haplotype was obtained for 47 individual sequenced from WA indicating that *G. scutellatus* is a recent introduction into Western Australia

Although New South Wales was thought to be the origin of *G. scutellatus*, Tasmania is the likely origin of *G. scutellatus* species D found in Western Australia



Implication of biological control in WA

Original collection of biological control agent by F.G.C Tooke was from Victoria/South Australia (the natural range of species F which is known to be present in South Africa). These were effective against *G. scutellatus* in South Africa and in many other countries where they have been introduced

To date all *Anaphes nitens* tested in WA has been sourced from NSW. They may have failed because they could not adapt to the new environmental conditions, the altered life cycle or they may not be a good parasitoid of species D

A. tasmaniae and *A. inexpectatus* from Tasmania could potentially be effective against species D in Western Australia



Acknowledgements

Dr. Rolf Oberprieler (Australian National Insect Collection) for performing all the morphological analysis and providing Herbarium samples from South Africa, Portugal and Spain. Without which I would not be able to have meaningful results.

The colleagues of Mamoru Matsuki; Kim Pullen (CSIRO Entomology), Andrew Loch (NSW DPI), Angus Carnegie (NSW DPI), P. Entwistle (NSW DPI), Rebecca Aigner (QLD DPI & F), Vin Patel (CRC Forestry), Jane Elek (Forestry Tasmania), Shana Read (Timbercorp Ltd), Ross Gillies (Timbercorp Ltd), John Holden (Timbercorp Ltd), Murray Anning (Timbercorp Ltd), Leah Goodrem (Murdoch University) who collected the specimens from the various plantations throughout Australia



