

Current and prospective biocontrol agents against Darwin's barberry

Chantal Probst





Background – Darwin's barberry

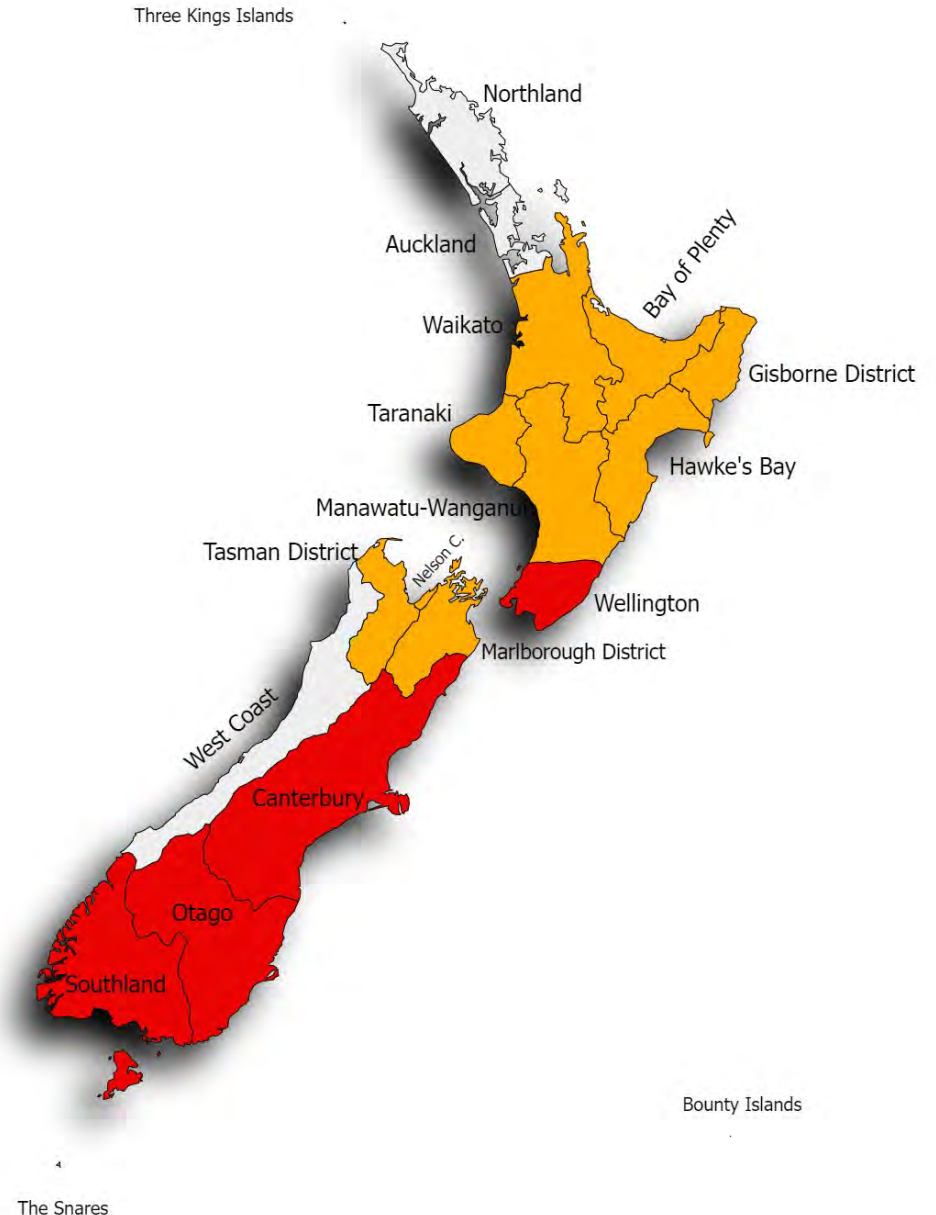
- Native to Chile and Argentina.
- Invasive in NZ, UK, Australia and USA.
- Naturalised in NZ in 1946.
- Fruits dispersed by birds and possums.
- Invades farmland, forest margins, roadsides and scrubland.
- Outcompete native plants.





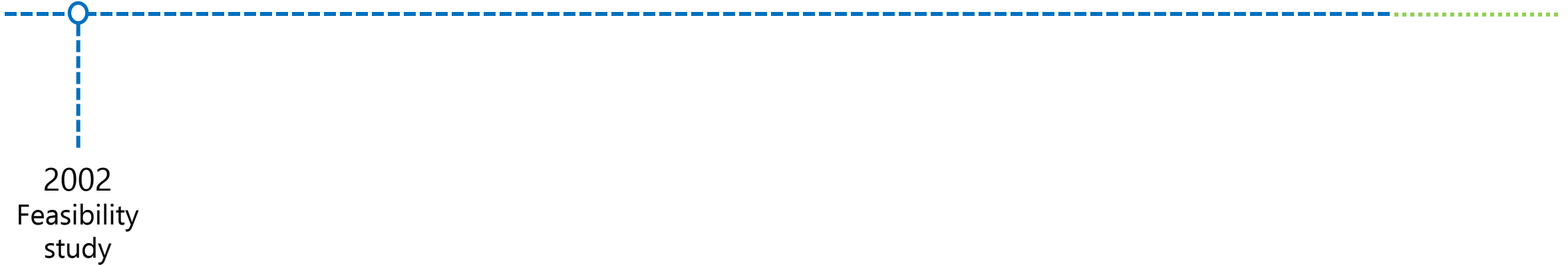
Distribution in NZ

- Widely distributed in NZ, from the East Cape/Te Urewera region to Stewart Island.
- Mostly patchy in Taranaki, King Country and Manawatu-Whanganui, but locally common in the Wairarapa and Wellington regions.
- In the South Island, patchy in Northwest Nelson/Buller and Canterbury, but common from central Canterbury throughout Otago and Southland.





Darwin's barberry biocontrol programme

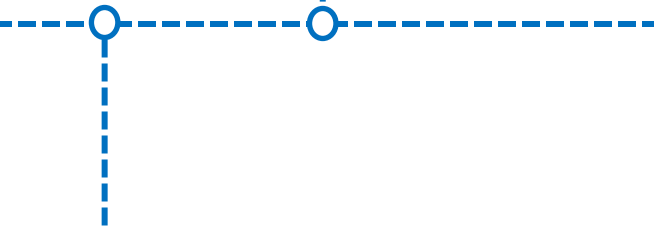


2002
Feasibility
study

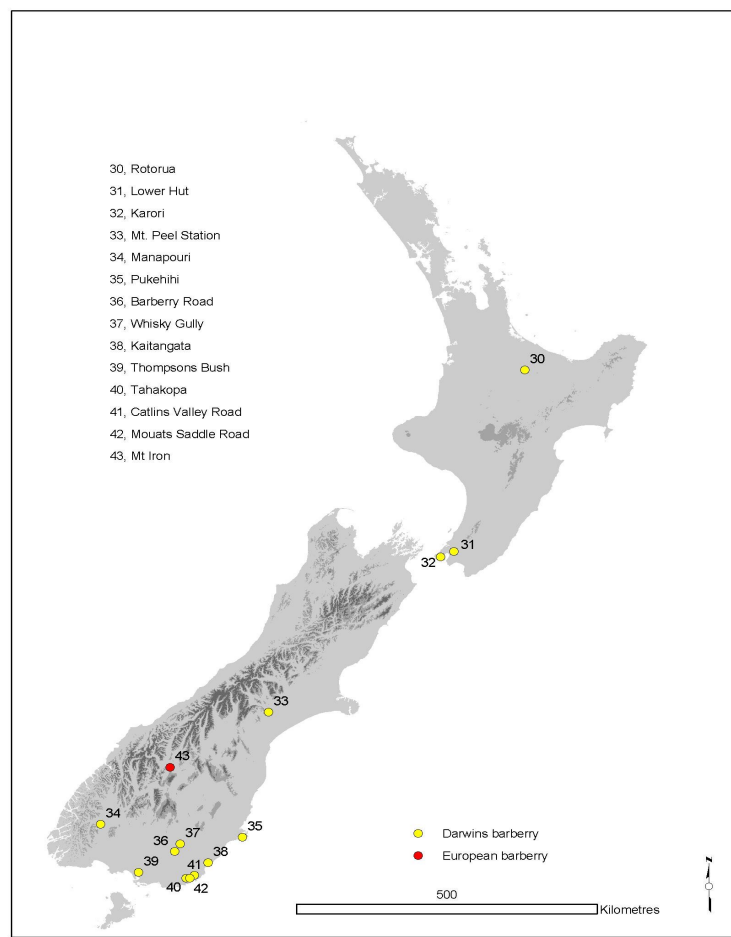


Darwin's barberry biocontrol programme

2003-2004
Invertebrate and
pathogen surveys
on DB in NZ

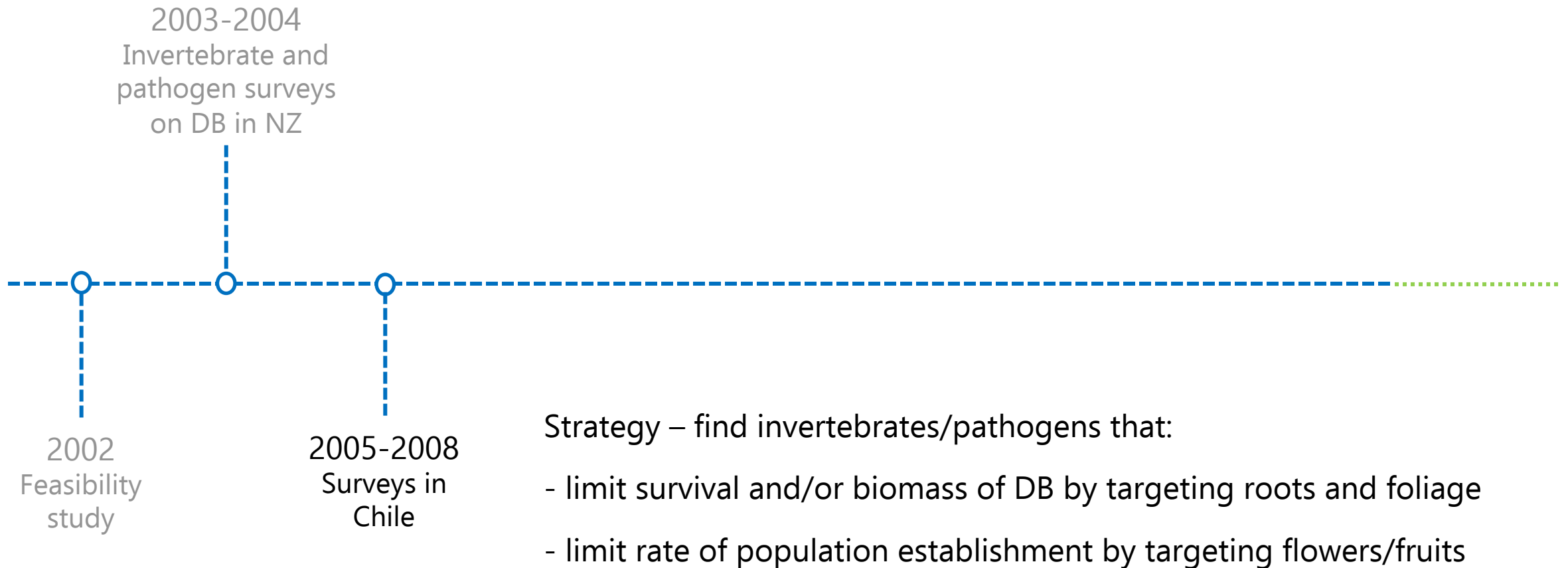


2002
Feasibility
study





Darwin's barberry biocontrol programme



DB in NZ vs. Chile



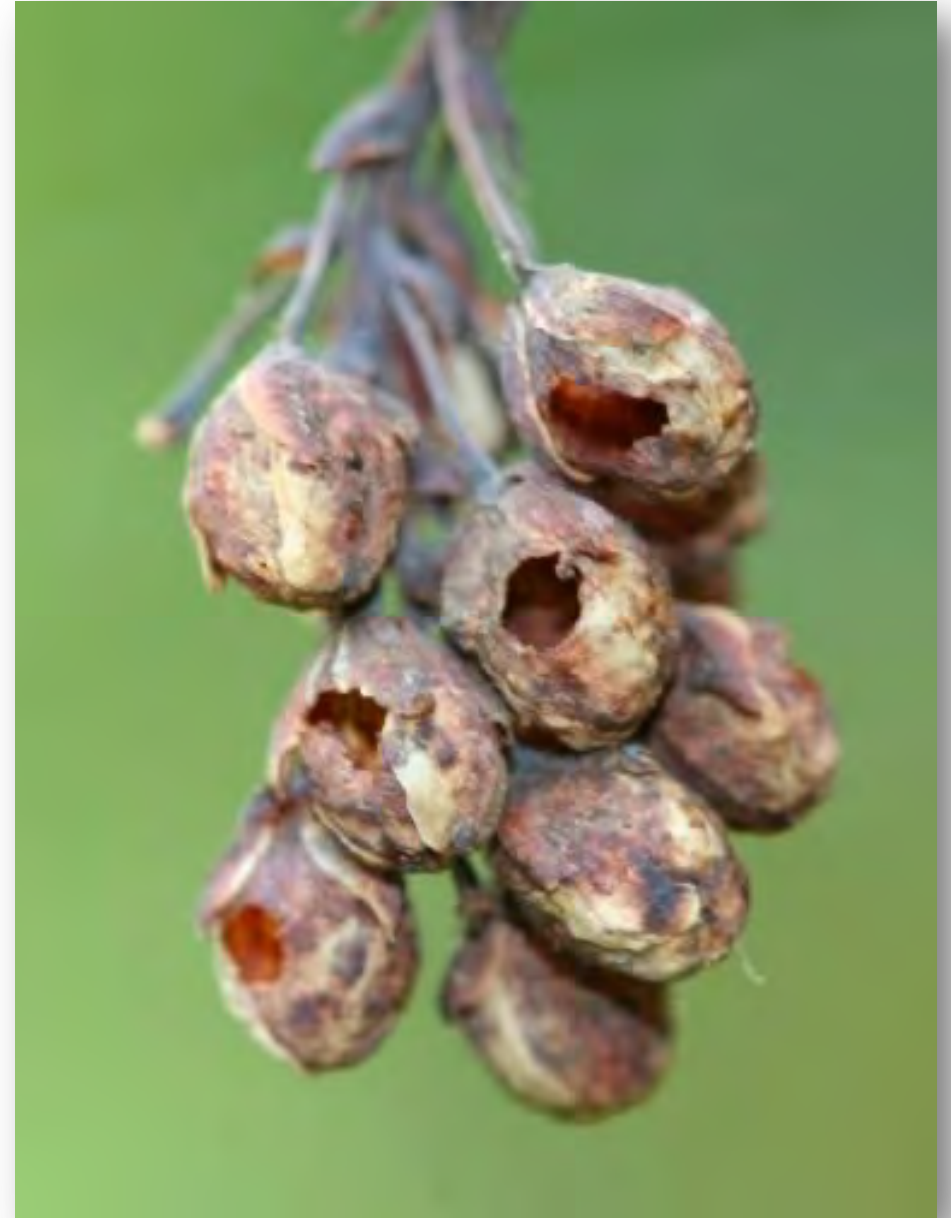
Berberidicola exaratus

seed feeding weevil



Anthonomus kuscheli

flower bud weevil



Darwin's barberry biocontrol programme



Berberis phylogeny



Order: Ranunculales

Family: Berberidaceae

Sub-family:

Berberidoideae

Genus: *Berberis*

Species: *darwinii*





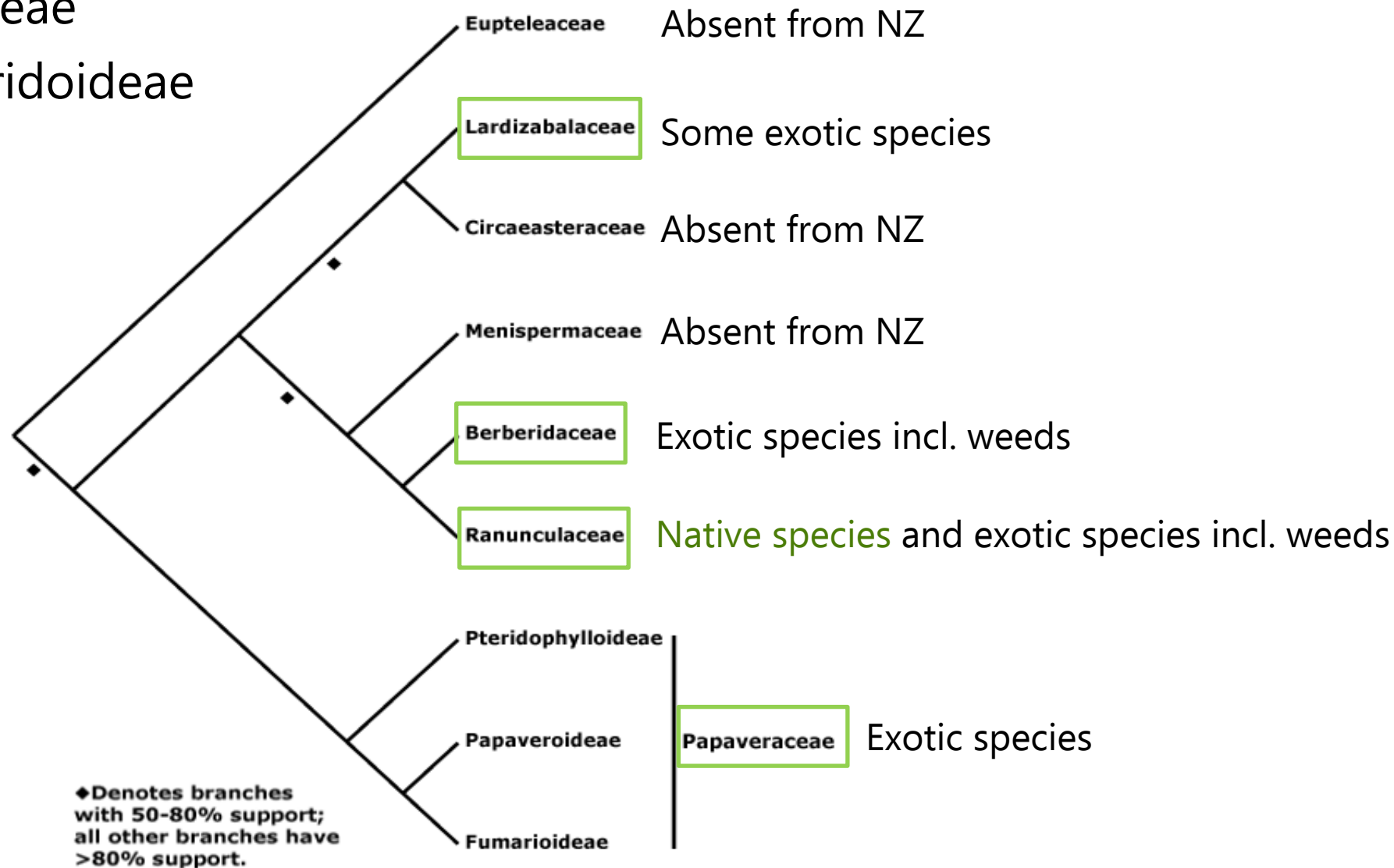
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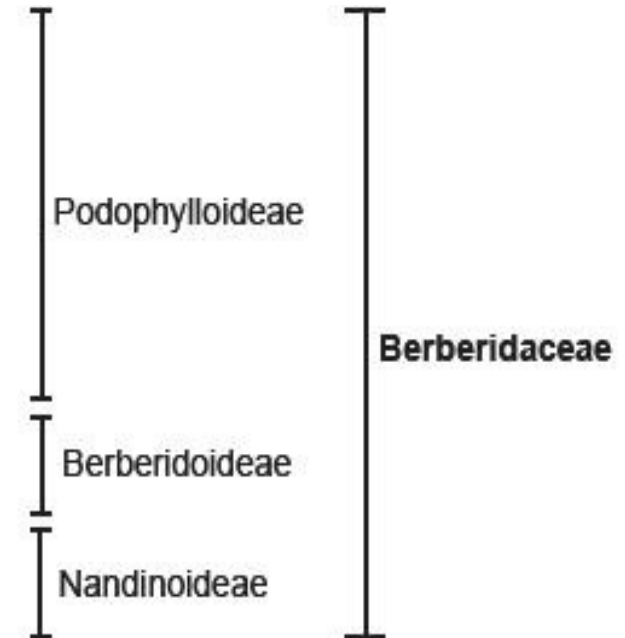
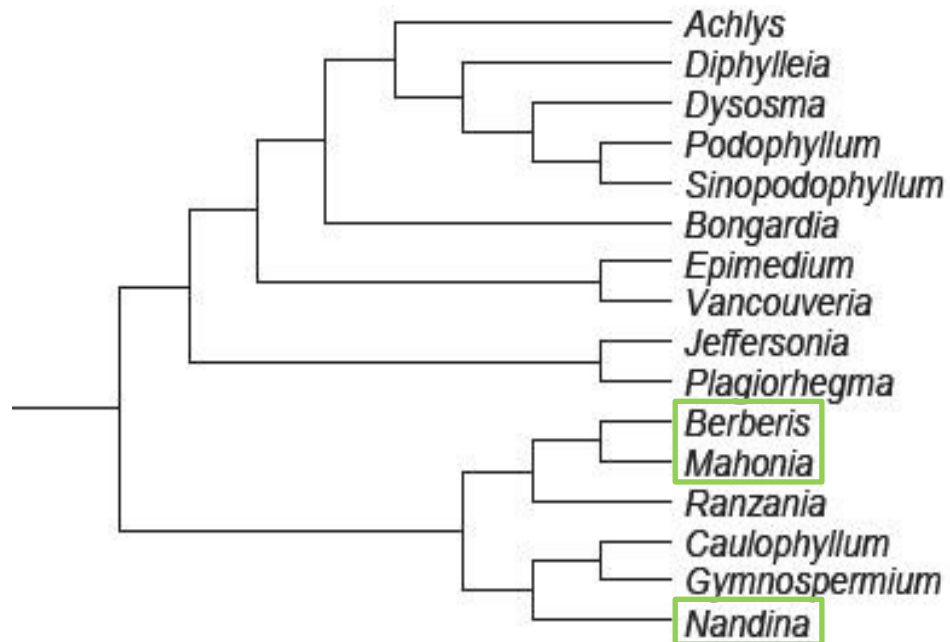
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Family: Berberidaceae

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Genus: *Berberis*

Species: *darwinii*





Order: Ranunculales

Family: Berberidaceae

Sub-family: Berberidoideae

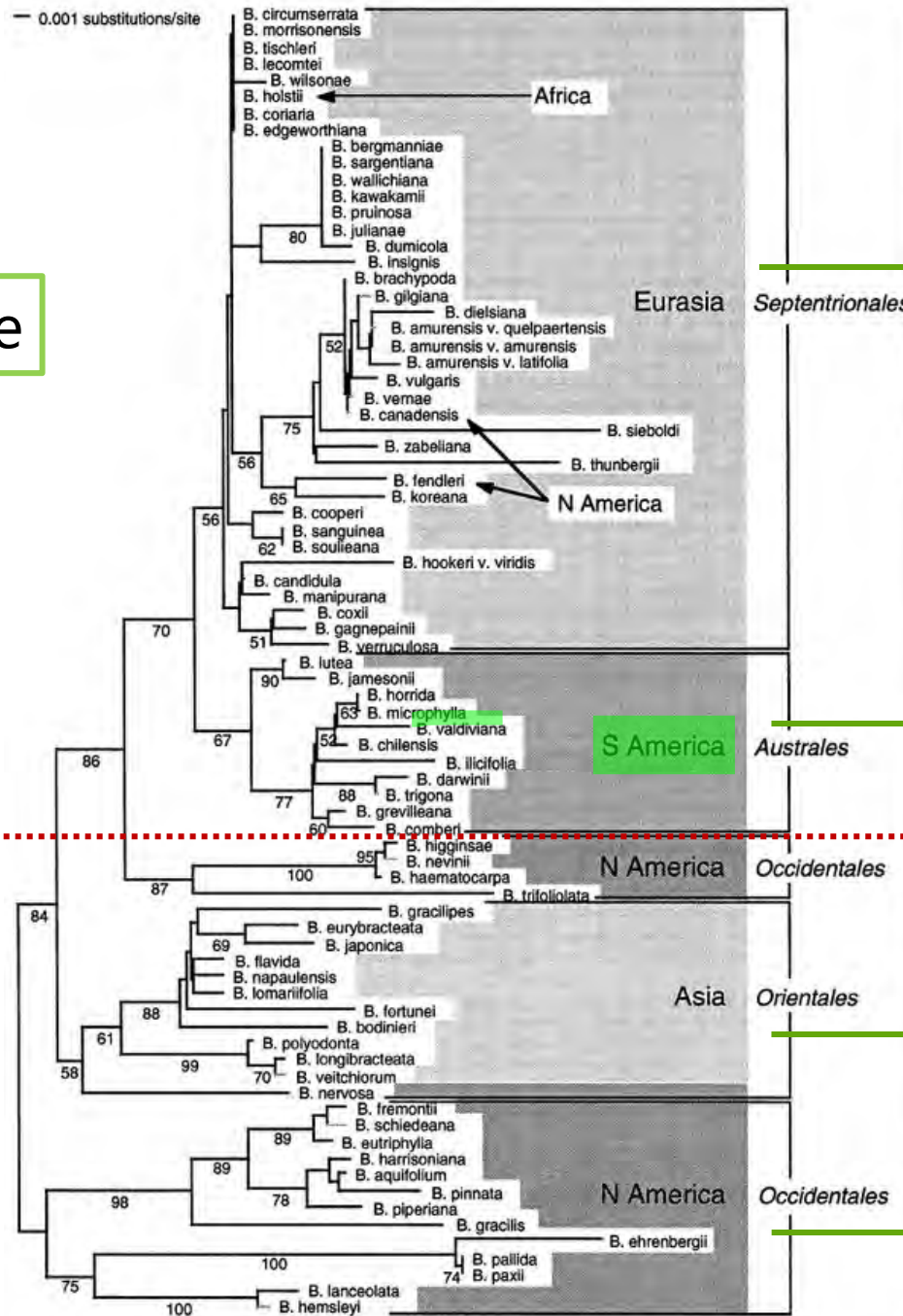
Genus: *Berberis*

Species: *darwinii*

Berberis

Mahonia

Kim et al. 2004. *J. Plant Res.* 117:175-182



B. glaucocarpa

B. vulgaris

B. soulieana

B. wilsonae

B. aristata

B. thunbergii

B. dielsiana

B. darwinii

B. congestiflora

Berberis x stenophylla

B. bealei *

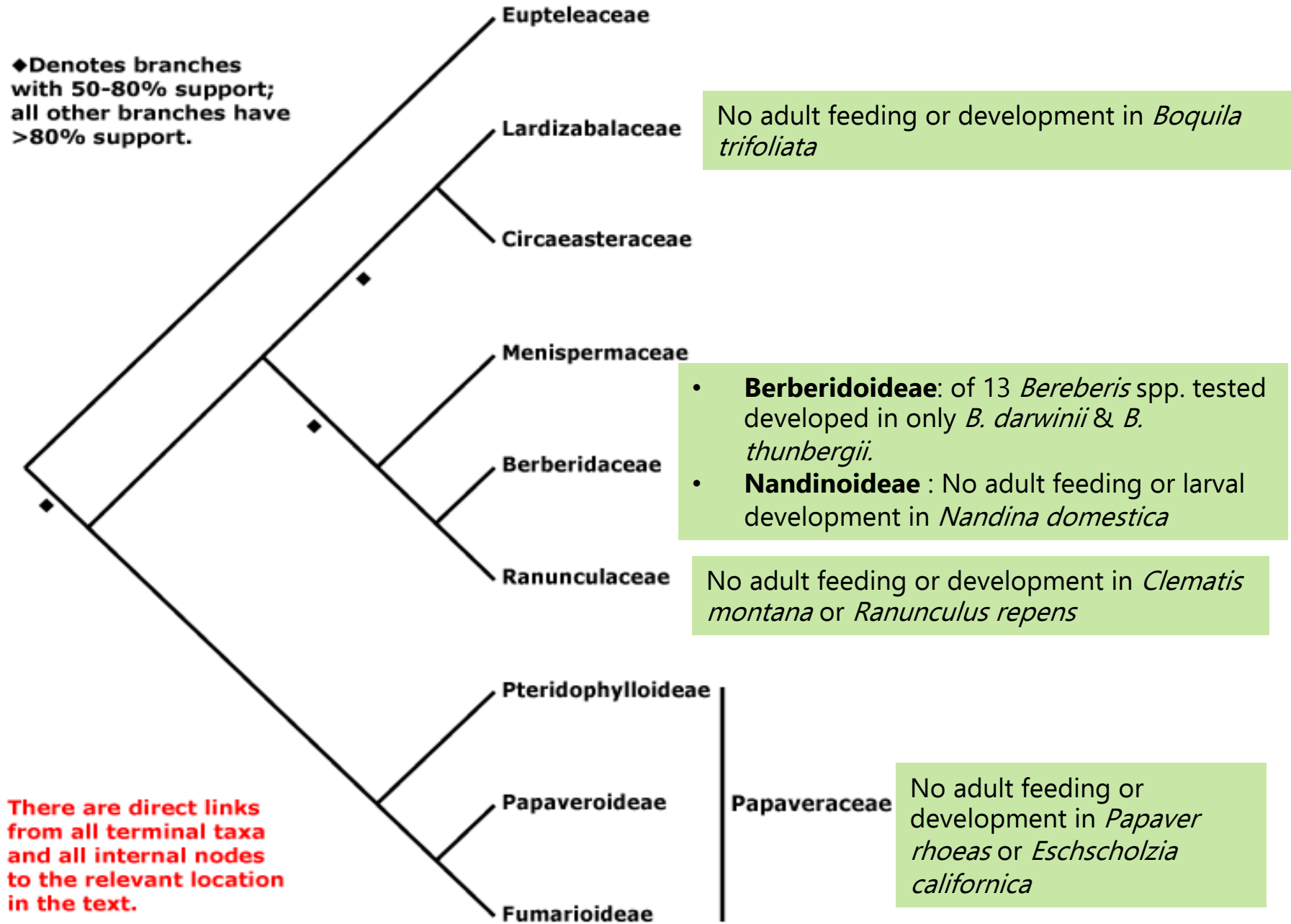
B. japonica

B. oiwakensis *

B. aquifolium

Anthonomus kuscheli

flower bud weevil

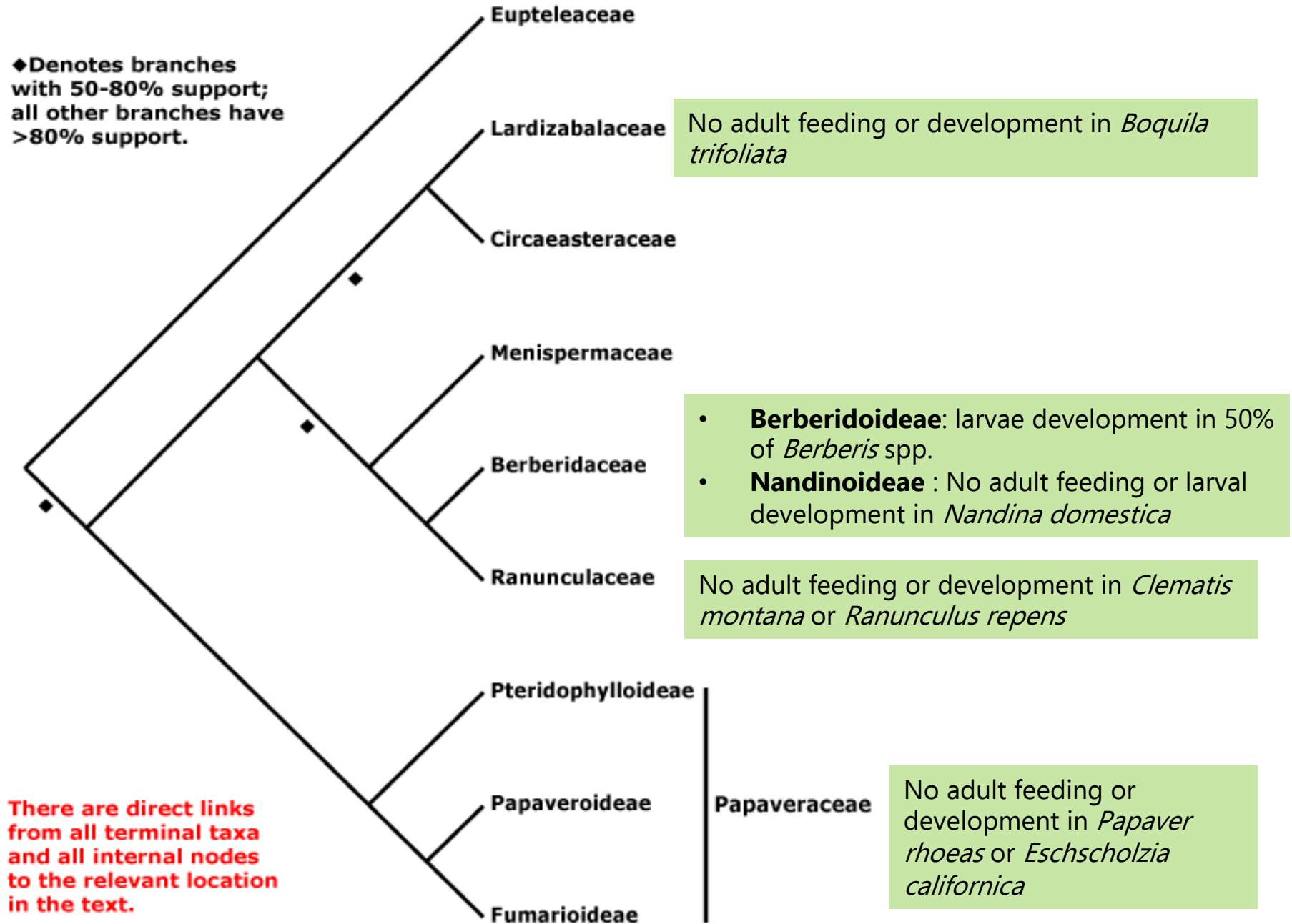


There are direct links from all terminal taxa and all internal nodes to the relevant location in the text.



Berberidicola exaratus

seed feeding weevil

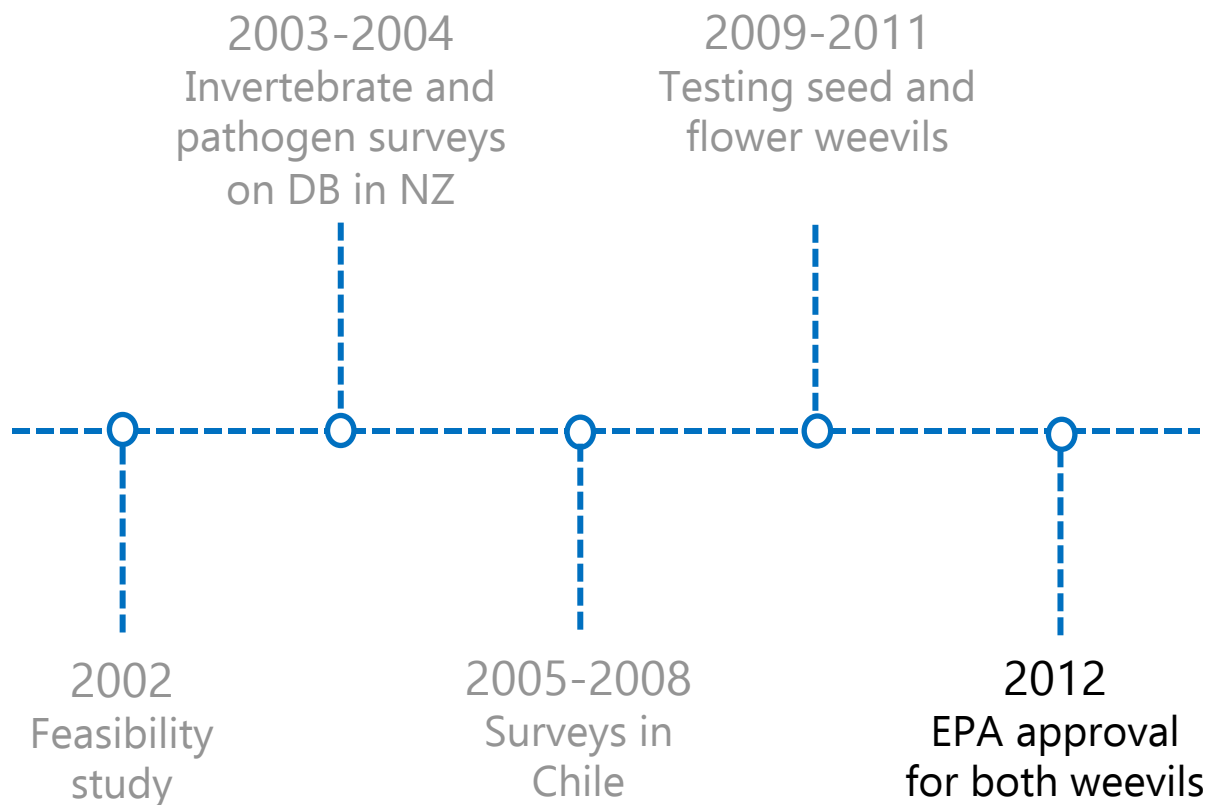




Darwin's barberry biocontrol programme



Environmental
Protection Authority
Te Mana Rauhi Taiao

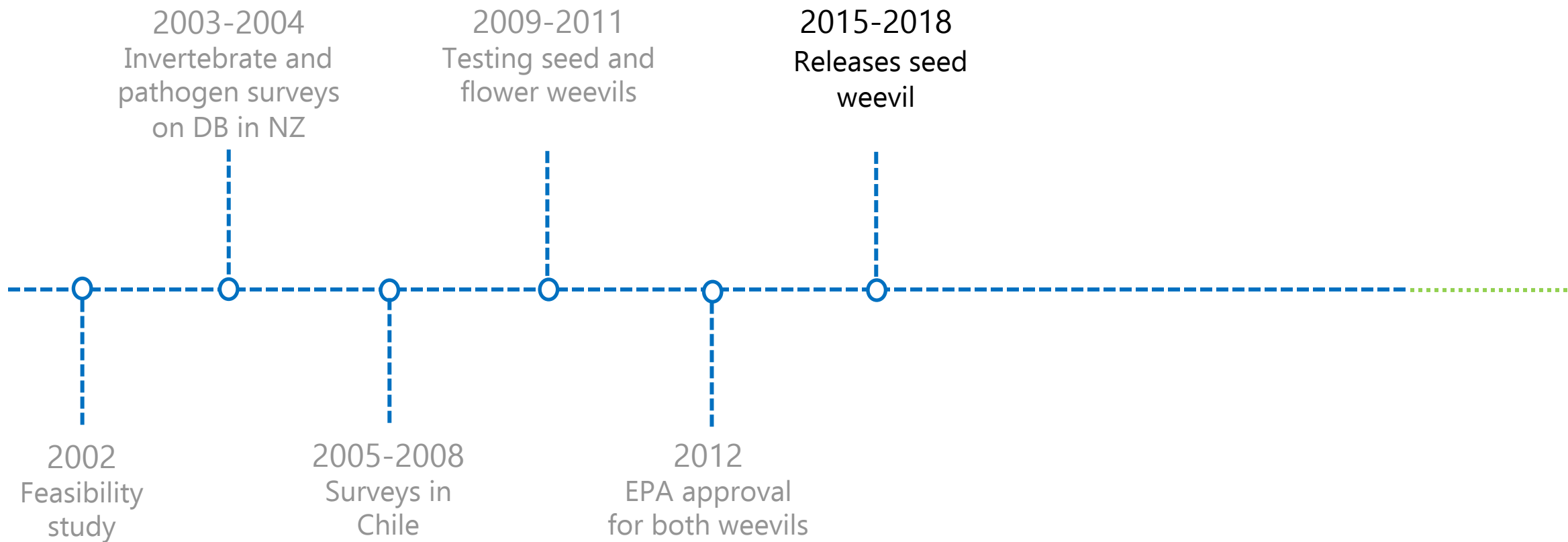


DECISION

Date	3 October 2012
Application code	APP201363
Application type	To release any new organism under section 34 of the Hazardous Substances and New Organisms Act 1996
Applicant	Environment Southland
Date application received	19 June 2012
Consideration date	11 September 2012
Considered by	A decision-making committee of the Environmental Protection Authority (the Committee) [†] Shaun Ogilvie (Chair) Helen Atkins Louise Malone
Purpose of the application	To release two weevils; <i>Anthonomus kuscheli</i> and <i>Berberidicola exaratus</i> , as biological control agents for the weed Darwin's barberry (<i>Berberis darwinii</i>)
The new organism approved for release	<i>Anthonomus kuscheli</i> <i>Berberidicola exaratus</i>



Darwin's barberry biocontrol programme



Releases in NZ

- Releases 2015 – 2018.
- Southland, Wellington, Manawatū-Whanganui.
- Establishment confirmed in Southland and Wellington.





Darwin's barberry biocontrol programme



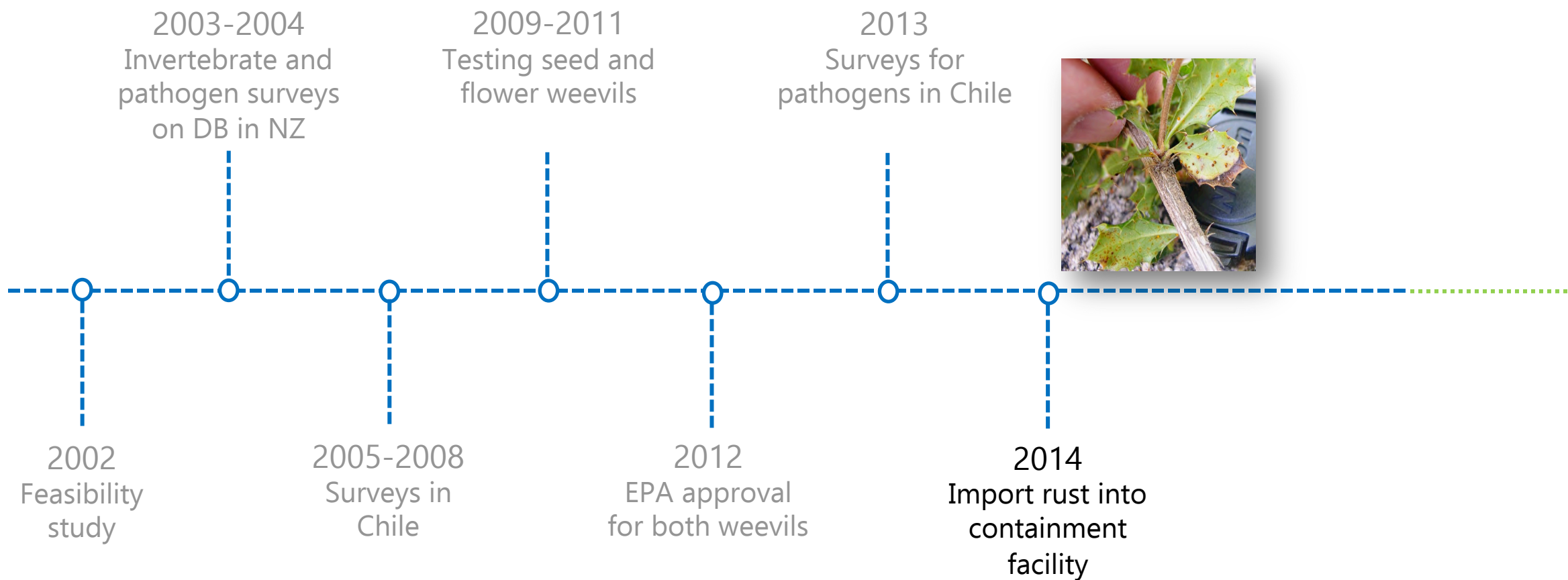
Puccinia berberidis-darwinii

rust fungus



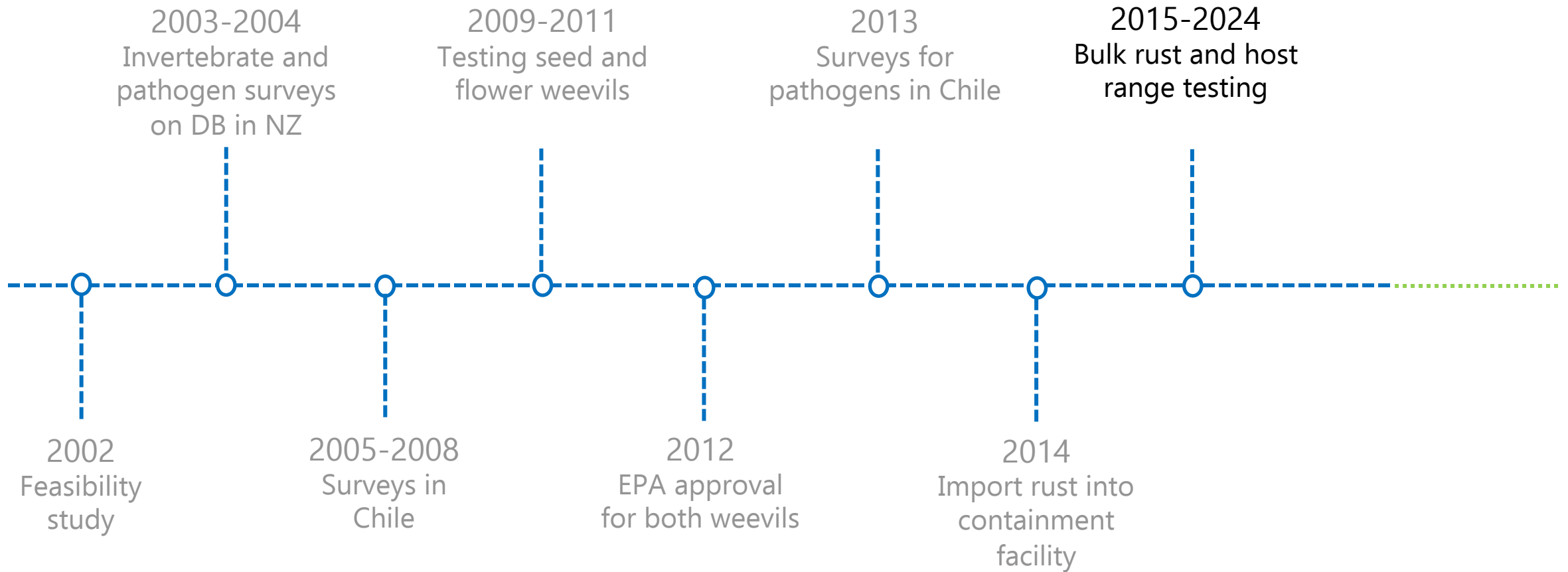


Darwin's barberry biocontrol programme



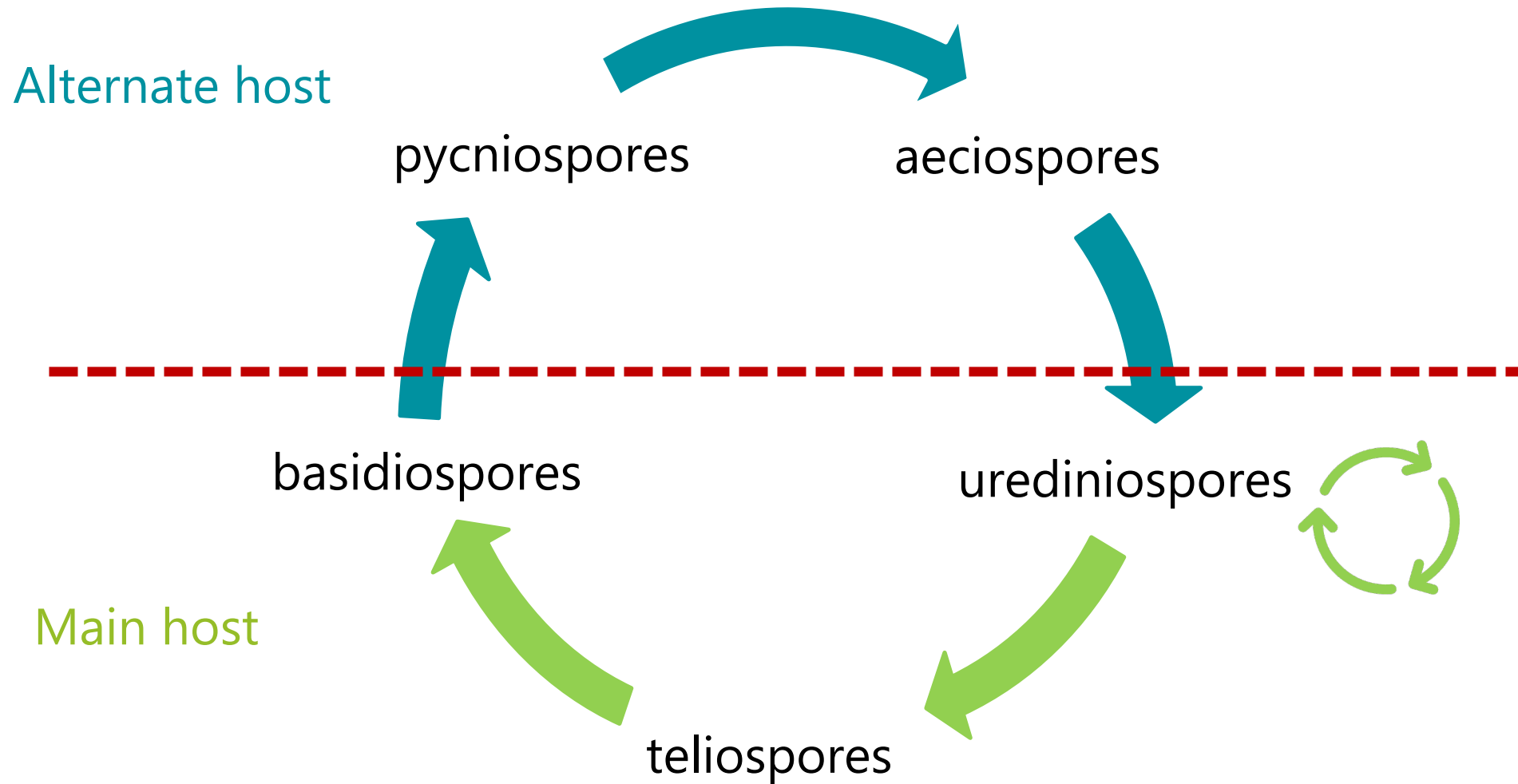


Darwin's barberry biocontrol programme



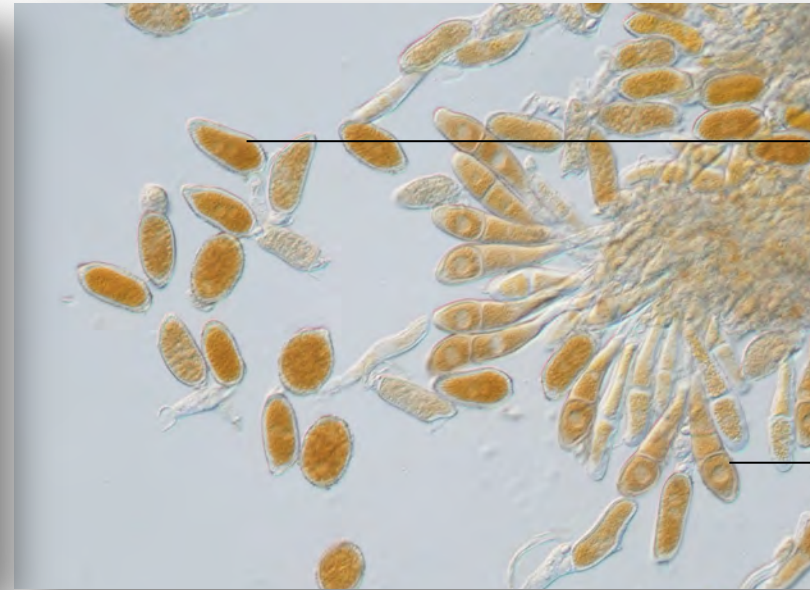


Life cycle of a macrocyclic rust





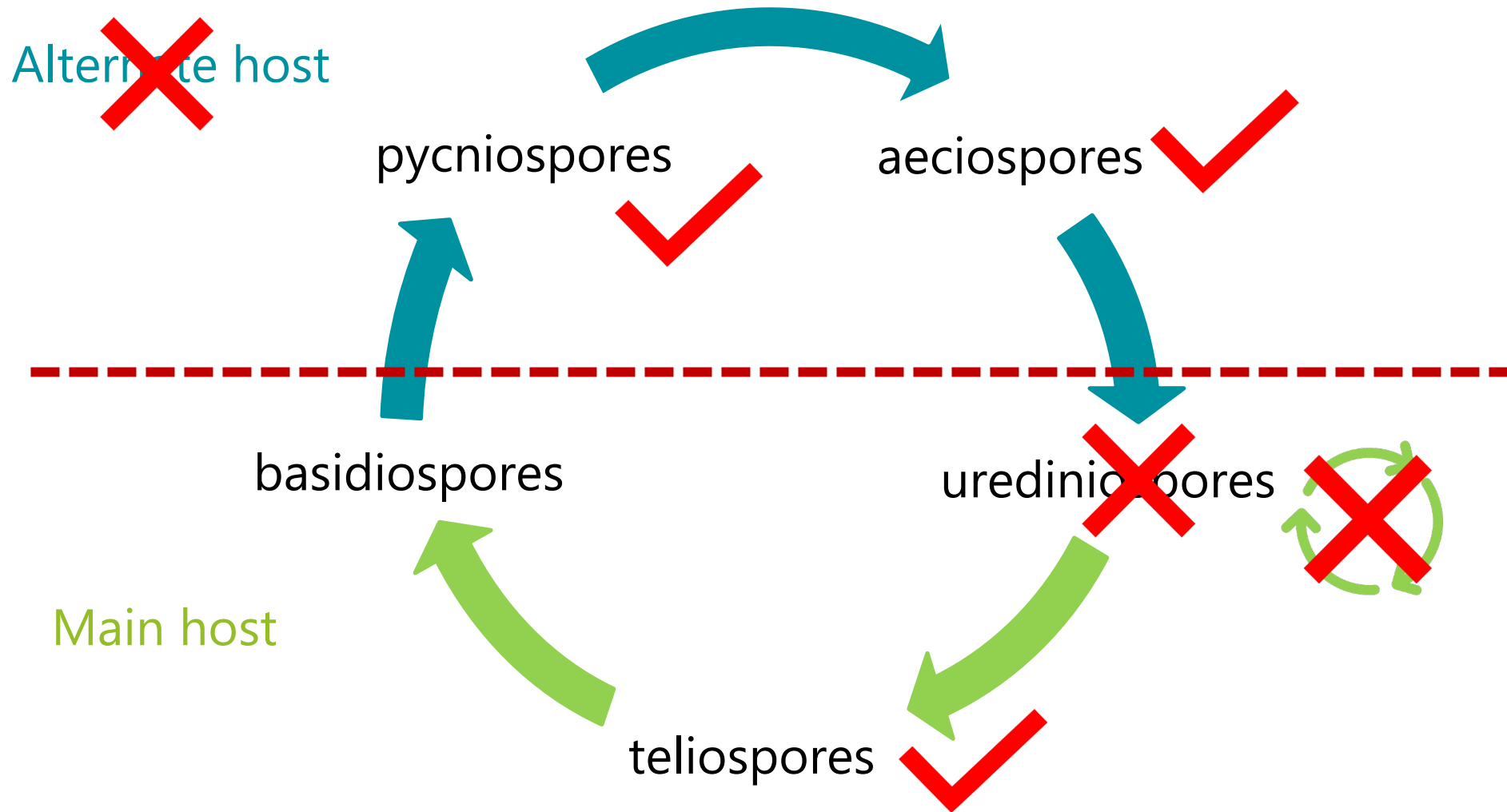
P. berberidis-darwinii spores



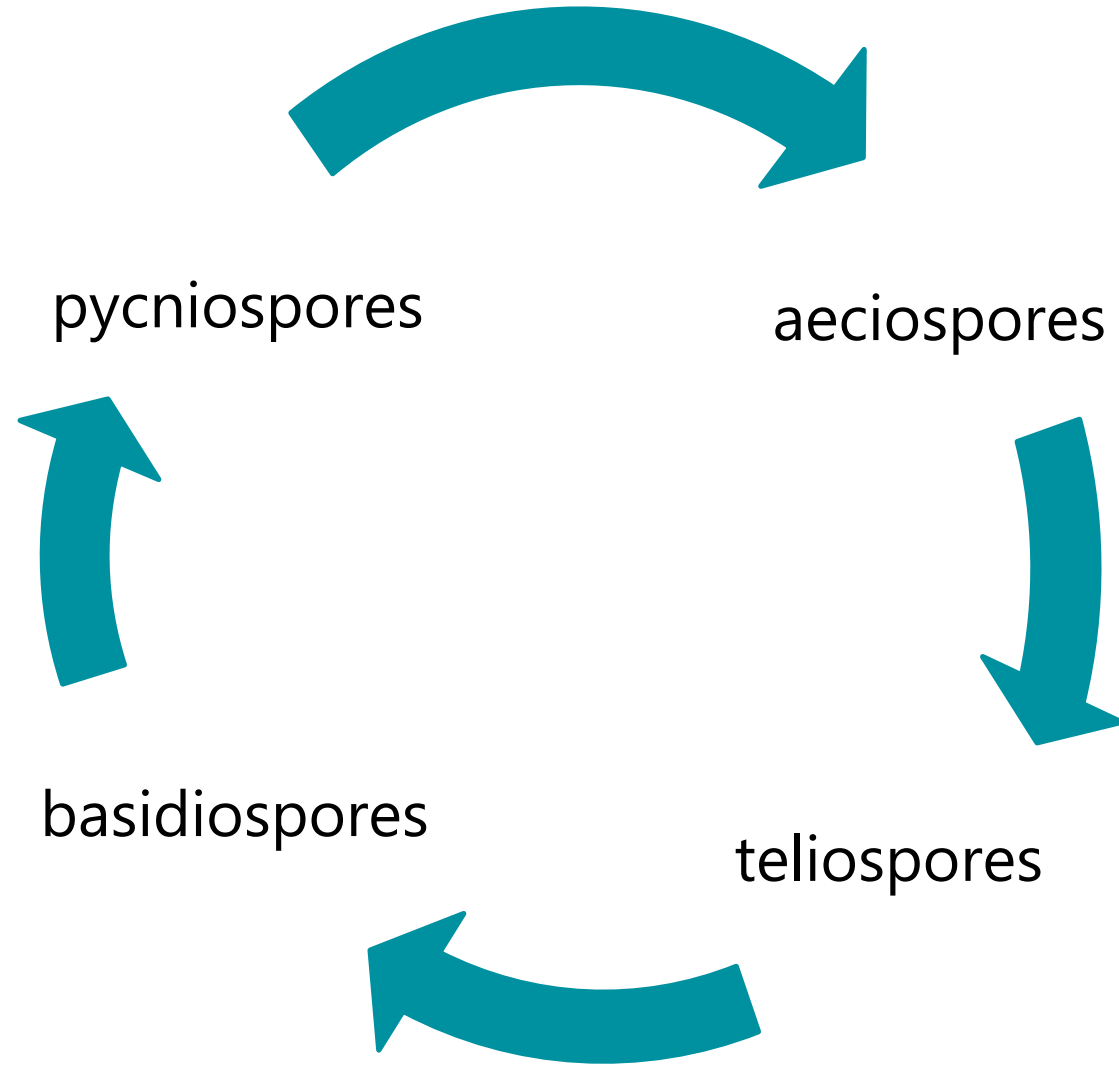
aeciospores

teliospores

P. berberidis-darwinii life cycle



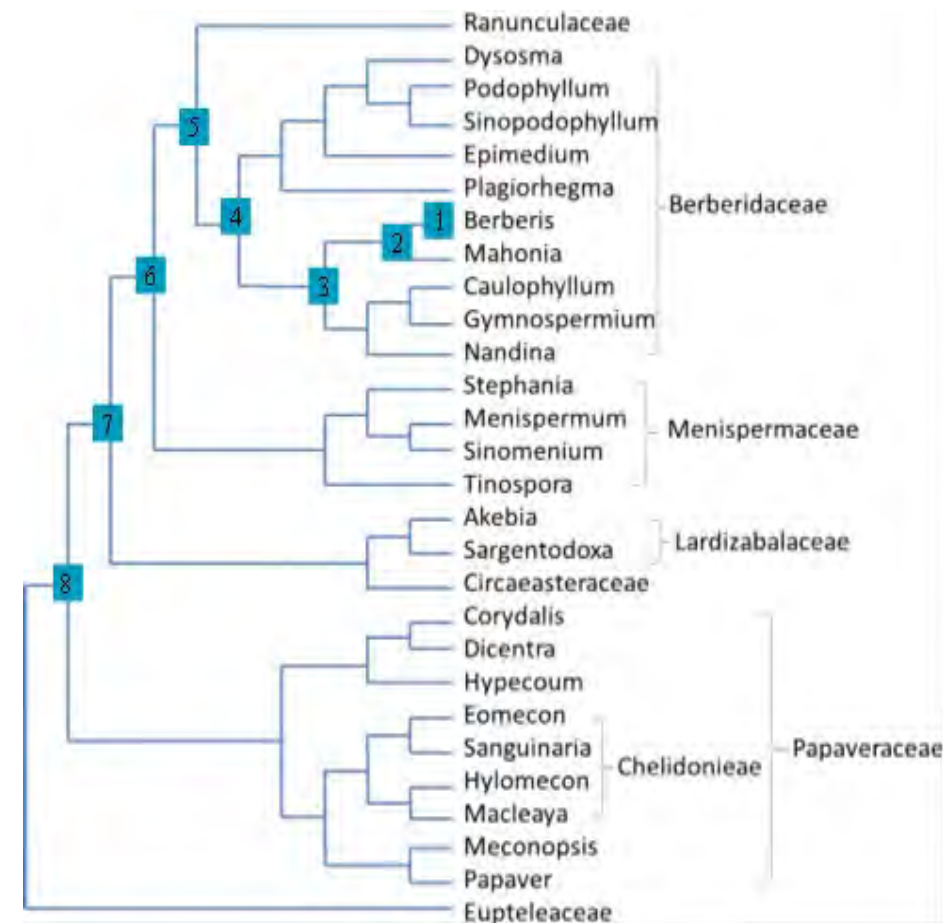
P. berberidis-darwinii life cycle





Host range testing for rust

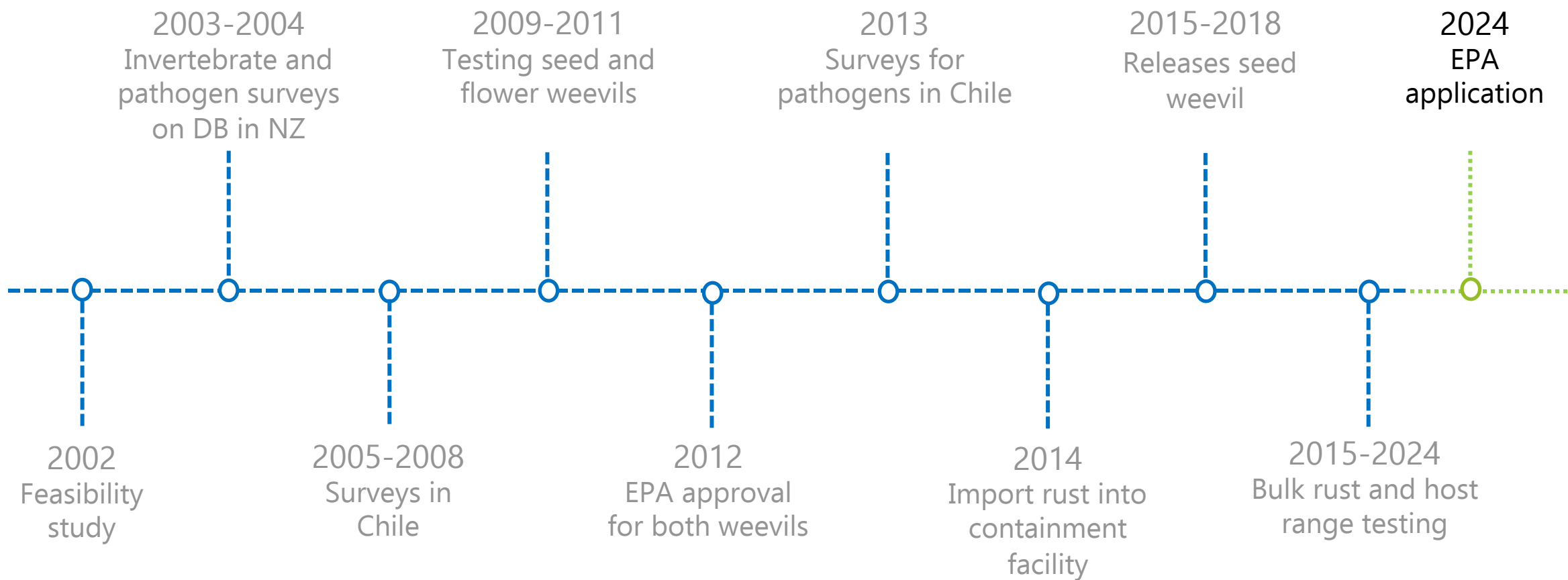
Level of relatedness	Latin name (synonym)	Common name	Family	Status in New Zealand	Pustules formed
Target	<i>Berberis darwinii</i>	Darwin's barberry	Berberidaceae	weed	yes
1	<i>Berberis glaucocarpa</i>	Barberry	Berberidaceae	weed	no
1	<i>Berberis thunbergii</i>	Japanese barberry	Berberidaceae	exotic, ornamental	no
1	<i>Berberis dielsiana</i> (<i>Berberis dasystachya</i>)	Diel's barberry	Berberidaceae	exotic, ornamental	no
2	<i>Mahonia fortunei</i> (<i>Berberis fortunei</i>)	Chinese mahonia, Fortune's mahonia or holly grape	Berberidaceae	exotic, ornamental	no
2	<i>Mahonia bealei</i> (<i>Berberis bealei</i>)	Leatherleaf mahonia or Beale's barberry	Berberidaceae	exotic, ornamental	no
2	<i>Mahonia lomariifolia</i> (<i>Berberis oiwakensis</i> subsp. <i>lomariifolia</i> , <i>Berberis lomariifolia</i>)	Chinese holly grape	Berberidaceae	exotic, ornamental	no
3	<i>Nandina domestica</i>	Sacred bamboo	Berberidaceae	exotic, ornamental	no
5	<i>Clematis forsteri</i>	Forster's Clematis	Ranunculaceae	native	no
5	<i>Clematis montana</i>	Mountain clematis	Ranunculaceae	exotic, ornamental	no
5	<i>Ranunculus aocalis</i>	Shore buttercup, dune buttercup or sand buttercup	Ranunculaceae	native	no
5	<i>Ranunculus repens</i>	Creeping buttercup	Ranunculaceae	weed	no
7	<i>Stauntonia hexaphylla</i>	Japanese staunton vine or sausage vine	Lardizabalaceae	exotic, ornamental	no
8	<i>Eschscholzia californica</i>	California poppy	Papaveraceae	exotic, ornamental	no



Wang et al. 2009. Perspectives in Plant Ecology, Evolution and Systematics 11(2): 81-110.



Darwin's barberry biocontrol programme





Acknowledgements

- Collaborators in Chile – Hernán Norambuena, Sergio Rothmann, Eugenio Sanfuentes
- National Biocontrol Collective
- MWLR staff – past and present

