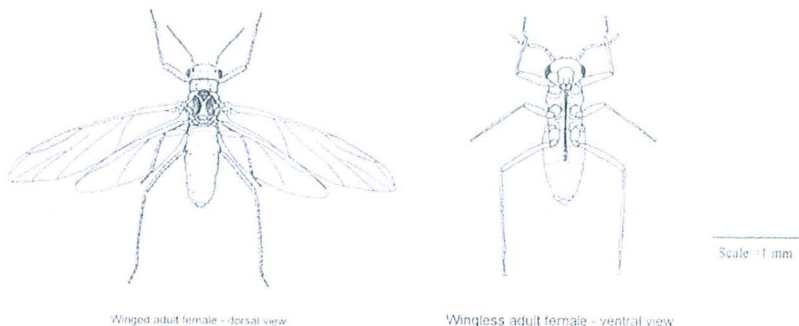


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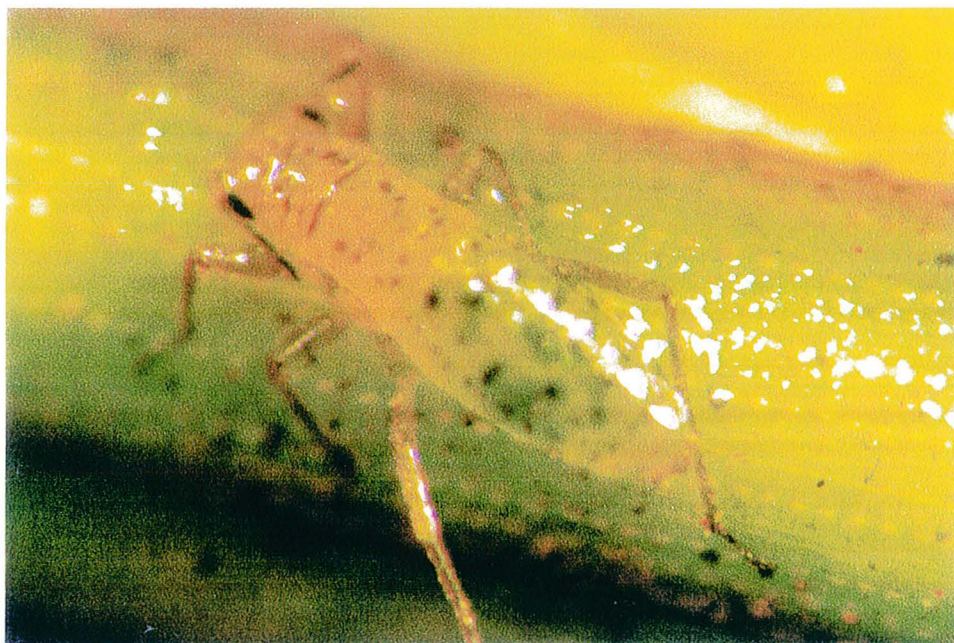
Department of Biodiversity,
Conservation and Attractions

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Essigella californica (Monterey Pine Aphid) — A new pest of Pines in Western Australia



The Monterey Pine Aphid, *Essigella californica* (Essig) is an aphid recently introduced into Australia. It was first found in March 1998 on *Pinus radiata* at Black Mountain ACT and within one year spread quickly throughout the pine growing regions of the eastern mainland states. It is originally a western North American species where it does not have pest status, and ranges from southern British Columbia to southern Mexico and east to Nebraska. It has also been recorded from Florida. The first records of this aphid outside North America were in France in 1989 and Spain in 1992. In France it has caused localised damage to pines where damage includes needle yellowing. On 27 June 2000 it was confirmed that this species had now reached Western Australia. The aphid was first found in the Blackwood Valley in a 1996 planting of *P. radiata*.

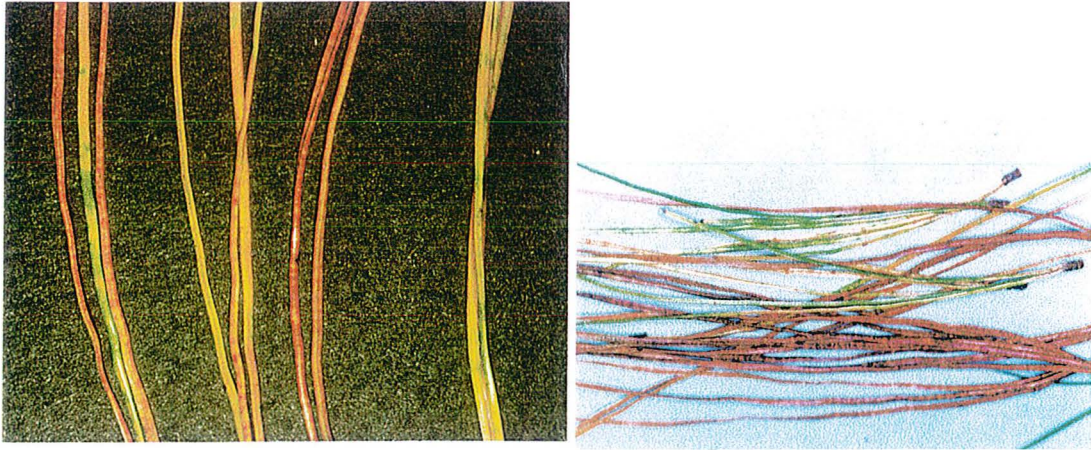


E. californica on *P. radiata*

Symptoms and Damage

Typical symptoms are yellowing and/or mottling or banding of older needles, followed by needle drop. Dead needles can remain on the tree for some time. The current year's needles are also attacked if aphid numbers are very high. The yellowing starts on the inner canopy and moves outwards. Eastern states experience

shows damage is more prevalent on older trees (10 + yrs), the top 1/4 to 1/3 of the tree being affected. Crowns are defoliated if aphid numbers are high. Younger trees are also attacked but they are more likely to recover. Also there is some confusion as to the damage being due to the needle drop fungus *Cyclaneusma*, drought or the aphid.



Mottling damage on *P. radiata* needles.



Needle browning and defoliation of *P. radiata*.

Hosts

In Australia it mainly infests *P. radiata*, however it has also been found on *P. caribaea*, *P. elliotii*, *P. patula*, *P. ponderosa*, and *P. canariensis*. It has been recorded on *P. pinaster*, but whether it can breed or is a problem on this species is not certain. In Western Australia it has also been found on *P. brutia* seedlings in a glasshouse.

Table 1 Hosts of *E. californica* in North America and France

Host	Common Name	Country	Status
<i>P. albicaulis</i>	White barked pine	NA	***
<i>P. monticola</i>	Western white pine	NA	***
<i>P. flexilis</i>	Limber pine	NA	***
<i>P. leiophylla</i>	Smooth-leaved pine	NA	***
<i>P. ponderosa</i>	Ponderosa pine	NA	***
<i>P. jeffryi</i>	Jeffrey's pine	NA	***
<i>P. engelmannii</i>	Apache pine	NA	***
<i>P. sabiniana</i>	Digger pine	NA	***
<i>P. coulteri</i>	Coulter pine	NA	***
<i>P. torreyana</i>	Torrey pine	NA	***
<i>P. radiata</i>	Monterey pine	NA, Fr	***
<i>P. attenuata</i>	Knobcone pine	NA	***
<i>P. muricata</i>	Bishop pine	NA	***
<i>P. strobiformis</i>		NA	*
<i>P. lambertiana</i>	Sugar pine	NA	*
<i>P. contorta latifolia</i>	Var Lodgepole pine	NA	*
<i>P. washoensis</i>	Washoe pine	NA	*
<i>Pseudotsuga menziesii</i>	Douglas fir	NA	*
<i>Pseudotsuga macrocarpa</i>		NA	*
<i>P. cembroides</i>	Pinyon pine	NA	-
<i>P. edulis</i>		NA	-
<i>P. monophylla</i>		NA	-
<i>P. quadrifolia</i>	var Pinyon pine	NA	-
<i>P. balfouriana</i>	Foxtail pine	NA	-
<i>P. aristata</i>	Bristlecone pine	NA	-
<i>P. contorta contorta</i>	Lodgepole pine	NA, Fr	-
<i>P. contorta murrayana</i>	var Lodgepole pine	NA	-
<i>P. contorta bolanderi</i>	var Lodgepole pine	NA	-
<i>P. ridgida</i>	Pitch pine	Fr	**
<i>P. strobus</i>	Eastern white pine	Fr	**
<i>P. taeda</i>	Loblolly pine	Fr	**
<i>P. virginiana</i>	Virginia pine	Fr	**
<i>P. griffithi</i>	Himalayan white pine	Fr	**
<i>P. banksiana</i>		Fr	**
<i>P. resinosa</i>		Fr	**
<i>P. densiflora</i>	Japanese red pine	Fr	-
<i>P. pinaster</i>	Maritime pine	Fr	-
<i>P. nigra pallasiana</i>	var Black pine	Fr	-
<i>P. sylvestris</i>	Scot pine	Fr	-

*** Frequently found; ** Found on; * Infrequently found; - Not found
NA (North America), Fr (France)

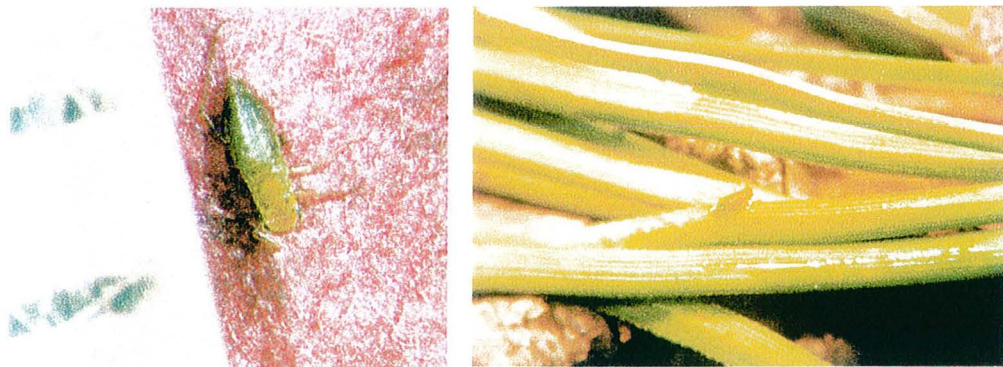
Table 2 Hosts of *E. californica* in Australia and New Zealand.

Host	Common Name	Locality
<i>P. radiata</i>	Monterey pine	WA, QLD, NSW, ACT, Vic, SA, NZ
<i>P. canariensis</i>	Canary Island pine	SA
<i>P. caribaea</i> var. <i>hondurensis</i>	Caribbean pine	QLD
<i>P. elliotii</i>	Slash pine	NSW
<i>P. patula</i>	Mexican pine	NSW, ACT
<i>P. ponderosa</i>	Ponderosa pine	ACT
<i>P. pinaster</i>	Maritime pine	NSW, WA
<i>P. muricata</i>	Bishop pine	NZ
<i>P. microcarpa</i>		NZ
<i>P. pseudotsuga menziesii</i>	Douglas fir	NZ

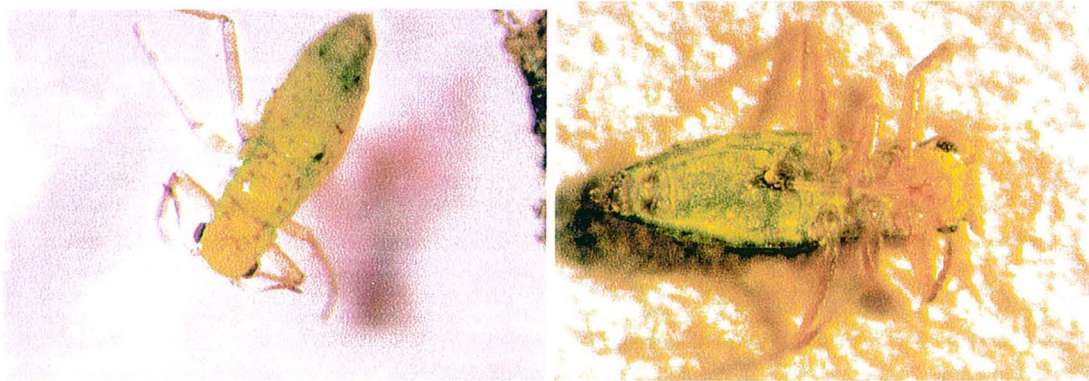
The aphid

The aphid is very small (1.0 – 1.5 mm), spindle shaped, with a grey green thorax and lime green abdomen. The abdomen usually has dorsal spots. They move fast and will often dart away or fall off a branch if disturbed. They commonly live and feed at the base of the needle sheath. They have been observed sitting singly on needles; spaced out along needles feeding head to tail; clustered around needle sheaths; and in heavy rain have been observed aggregating on the underside of lateral branches.

Early studies have shown that the aphid has 3 instars (nymphal stages). This is unusual since most aphids have 4 instars. At 20°C instar duration is between 2-3 days and adult survival in culture is 7 – 36 days. In culture mean fecundity is 4.4, but as many as 30 offspring have been recorded for one adult. Adults can be winged (alates) or wingless (apterous). Alate adults enable dispersal to new sites.



E. californica is very small, bands on ruler represent 1 mm. Figure on right shows *E. californica* on *P. radiata* needles.



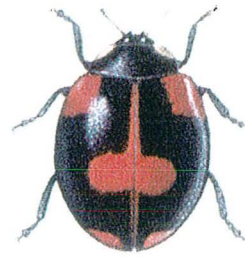
Left, dorsal view of *E. essigella*. **Right**, ventral view of aphid.

Predators

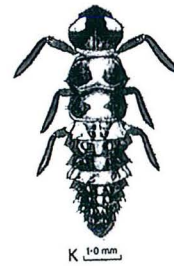
Predators that commonly fed on aphids include ladybird beetles, lacewings and hover flies. Species of all these generalist predators have been observed in the aphid infested pines in Western Australia. However, while these predators can be quite voracious, they tend to be ineffective in suppressing populations. These insects usually invade only after large numbers of their prey have developed.

Ladybird beetles (Coccinellidae): Unlike the common garden ladybird, the beetle often found in pines is colour reversed, with black wing covers and red spots. Ladybird larvae are voracious feeders and usually hunt in aphid infested foliage.

They can be identified as black and white or pale brown grubs lurking in the pine needles.



Ladybird beetle adults. **Left**, common garden form (*Harmonia conformis*). (reproduced from "Australian insects in Colour." H. Healy and C. Smithers, Treasure Press 1971). **Right**, black beetle with red spots, a form often found in Western Australian pines.



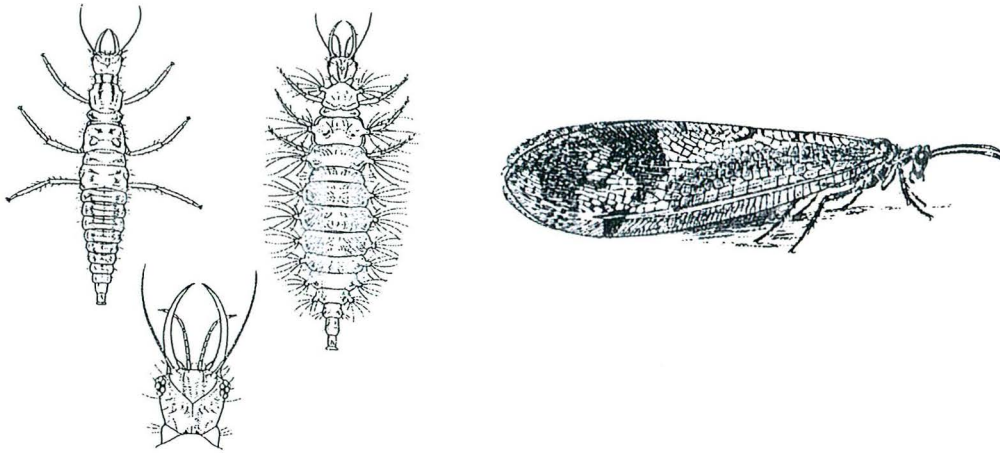
Left, larva of common red ladybird as seen above (*Harmonia conformis*). (Reproduced from "Australian insects in Colour." H. Healy and C. Smithers, Treasure Press 1971).

Right, diagram of ladybird larva (*Coccinella transversalis*). (Reproduced from "Insects of Australia.", CSIRO 1991).

Lacewings (Neuroptera): The adults appear as delicate lacey-winged insects. The most familiar lacewing adult is green (Chrysopidae), but more commonly in pines the species is brown (Hemerobiidae). The juvenile nymphs have very savage mouthparts and can be seen actively patrolling for food. Alternatively some species appear cryptic and attach debris to their bodies for camouflage.



Lacewing larvae found in aphid infested pines in Western Australia (fam. Hemerobiidae).



Left, lacewing larvae. Right, lacewing adult. (Reproduced from "Insects of Australia.", CSIRO 1991)

Hover flies (Syrphidae): Adult hover flies are generally nectar feeders, but in its larval state this insect is an aggressive predator. Larvae are spindle shaped, creamy white to brown and maggot like. Hover fly eggs are often found amongst aphid infested foliage. Eggs are laid singly and appear as tiny rice grains.



Left, hover fly egg. Right, hover fly larva feeding on an aphid. (Reproduced from "Australian Insects in Colour." H. Healy and C. Smithers, Treasure Press 1971)



Hover fly adult. (Reproduced from "Australian Insects in Colour." H. Healy and C. Smithers, Treasure Press 1971)

Parasitoids

Wasp parasites can be more specific in terms of their preferred food/host and are therefore more widely used agents for biological control. Due to their narrower specificity they can function more effectively at low aphid densities than the generalist predators. To date there are no known parasitoids of *E. californica*. The only parasitoid known to infest the genus *Essigella* is a Braconid wasp in the genus *Diaeretus* from California. The poor state of knowledge regarding the parasitoids of *Essigella* is due to its lack of pest status in its native habitat.

Prognosis

Experience in eastern Australia shows aphid populations drop in winter and pick up in spring and autumn, with peak population levels around March or April. However during the initial establishment phase aphids can be found on trees during winter, particularly June and early July. Furthermore the aphid impact may not be as high as first thought, since in subsequent years after population establishment, the population drops. Studies so far indicate there could be an impact on growth rates following the initial population wave, however young trees affected quickly recover. Also initial findings from eastern Australia indicate damage impact in the first year was a combination of factors which included drought and was not necessarily attributable to the aphid alone.

In Western Australia, for this first year, populations could be high, particularly if this year is dry. However, indications are that population levels will drop in subsequent years.

Monitoring and Research

CALM is currently surveying plantations to determine its distribution in Western Australia. Monitoring sites have already been set up in NSW, Victoria and South Australia. These sites are to study the fluctuation of aphid numbers throughout the year and to examine the extent of defoliation and subsequent recovery of trees infested with aphids. Little is known about *Essigella* and research is currently examining the aphid's biology and interaction with trees. Research institutes such as CSIRO will also consider investigations into the potential for biological control with native parasitoids.



E. californica on *P. radiata*.

July 2000
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