

## THE DISTRIBUTION, DISPERSAL AND HOST RANGE OF *ANTHERAEA EUCALYPTI* (Lepidoptera : Saturniidae) IN NEW ZEALAND

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*Abstract:* *A. eucalypti* is known to have been established in New Zealand since 1915. Its natural rate of spread has been, and still is, slow, but a number of isolated populations in the North Island and one in the South Island have become established as a result of transportation by man. Of the 60 species of *Eucalyptus* sampled in New Zealand only 18 have been confirmed as hosts of *A. eucalypti*. Although this insect has not yet caused any serious damage, it may have the potential to become a pest if it spreads into North Auckland or if palatable species of *Eucalyptus* are planted extensively in areas where it is already established.

### Introduction

The Gum Emperor Moth (*Antheraea eucalypti* Scott) was originally reported to have become established in the Taranaki District of New Zealand about 1923 (Miller 1925), but a specimen collected at Wanganui in 1915 was subsequently reported (Wise 1955) so it was probably established at or before the turn of the century. It is believed to have been accidentally introduced from Australia as pupae on imported hardwood poles, but deliberate introduction of such a spectacular insect cannot be ruled out.

For many years it was common knowledge that this insect was present in the Palmerston North-Bulls-Wanganui area, and doubtfully in New Plymouth. It did not appear to cause any significant damage, and was regarded merely as a curiosity.

In 1957 a eucalyptus tree died at Bulls after being completely defoliated by *A. eucalypti* larvae. About the same time there were several reports suggesting that this moth was present in a number of widely scattered points in the North Island, including areas where increased commercial planting of *Eucalyptus* was being considered. It was therefore decided to conduct a preliminary survey of the distribution and host range of this insect.

Many hundreds of samples were taken from 60 species of *Eucalyptus* throughout the North and South Islands between 1957 and 1962, and less intensive inspection is still maintained today.\* Whenever specimens of *A. eucalypti* were found they were forwarded to the Forest Biology Survey Laboratory at Rotorua together with a specimen of the host plant, information about the location of the collection, and other relevant data.

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\* Details of these collections are contained in the unpublished technical reports of the Forest Biology Survey of the N. Z. Forest Service, copies of which are held at the Forest Research Institute, Rotorua and at N. Z. Forest Service Head Office in Wellington.

### *Life History and Natural Enemies*

Moths fly and lay eggs from late October to mid-December, and even on into February, depending on the weather and the locality. Larvae feed from November to February, and pupation may occur from mid-January. The insect enters diapause until the following spring when the adult emerges.

Although many larvae and pupae collected in the field have been reared in the laboratory, no parasite has ever been obtained from them. A virus disease has sometimes caused mortality of larvae in the laboratory, there is one report of a muscardine fungus infecting a larva (Close 1956), and the introduced Australian magpie (*Gymnorhina tibicen* (Latham)) has been observed eating the pupae.

Apart from these isolated records the species would seem to be free of predators and parasites in New Zealand.

### *Distribution*

As shown on the map (fig. 1) the survey confirmed an area of general colonization between Wanganui and Palmerston North, extended it north through Taranaki to a smaller area around New Plymouth, south as far as Upper Hutt, and inland throughout the Manawatu and east of the Tararua Range to Masterton. It also revealed apparently isolated populations near Napier, Gisborne, and Ruatoria; between Te Kuiti and Tamuarunui; and a more extensive area of colonization between Tokoroa and Hamilton extending to the coast just North of Kawhia.

It had not been found in the South Island until 1968 when a specimen was collected at Tasman near Nelson.

*A. eucalypti* has been reported from other localities but these are not recorded here because specimens have not been collected from them. This insect is very difficult to find in the field. The large colorful larvae blend perfectly among *Eucalyptus* leaves and can, if motionless, remain unobserved within 18 inches of a searcher's eyes. The dull brown cocoons are also well camouflaged, being spun in crevices or corrugations in the bark on large stems or main limbs, and sometimes in the crotches of small branches high in the crown. The moths are nocturnal and are rarely observed or captured. The failure to collect *A. eucalypti* from any area where *Eucalyptus* is grown is therefore no guarantee that it is not present. There is every chance that further populations will be discovered in other places.

### *Dispersal*

Little is known of the behaviour of the adult moth, but it would appear to be a reluctant flyer, not moving far from its point of emergence. The extent of the area of general distribution achieved by *A. eucalypti* since its latest known date of establishment, and the recorded increase in its spread since 1957, would tend to confirm that it is an animal with poor powers of dispersal. This makes it difficult to explain the isolated populations found elsewhere in the country.

In the Tokoroa district it was noted that established populations were often discovered within sight of a country school. Taking live larvae to other such schools led to several more populations being recorded, the children recognised the larvae and stated exactly where they could be collected. Discussions with teachers revealed that *A. eucalypti*

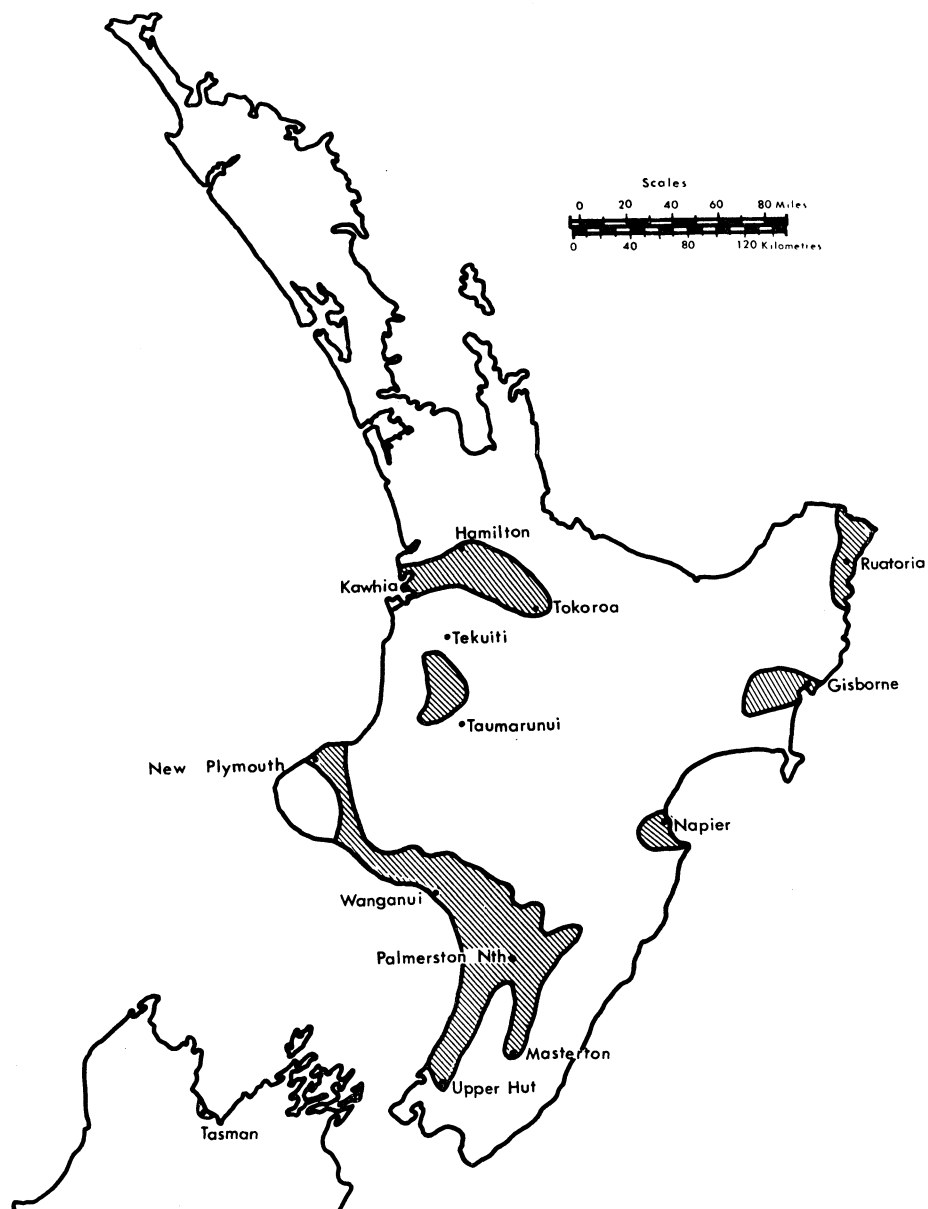


Fig. 1. The areas in New Zealand where *A. eucalypti* is known to be established.

was often used as a demonstration animal in nature study classes, many teachers obtaining supplies of cocoons from their colleagues in Palmerston North and Wanganui. Considerable quantities of cocoons are known to have been posted as far afield as Auckland, Christchurch and Nelson. It is also known that people on holiday take larvae or cocoons home with them from those areas where *A. eucalypti* is more common. Larvae

are often liberated in gardens, dormant cocoons frequently thrown away as dead, and moths emerging just before summer holidays are liberated from schoolrooms. It is not surprising that isolated populations of *A. eucalypti* are established hundreds of miles from the original point of entry into the country.

#### Host Range

Early references record the larvae feeding on "gums", liquidambar (*Liquidambar styraciflua* L.) and the pepper tree (*Shinus molle* L.) (Cottier, in Atkinson, 1956). Table I lists the species of *Eucalyptus* on which *A. eucalypti* has been recorded feeding between 1957 and 1969. There is a record of the larvae feeding on the leaves of apricot (*Prunus armeniana* L.) in New Plymouth (B. May, pers. comm.) and it has twice in recent years been reported feeding on Silver Birch (*Betula alba* L.). On the latter late instar larvae fed for two weeks and successfully pupated.

Table I. Species of *Eucalyptus* attacked by *A. eucalypti* in New Zealand.

<i>E. botryoides</i> Sm.	<i>E. maideni</i> F. v. M.
<i>E. bridgesiana</i> R. T. Bak.	<i>E. melliodora</i> A. Cunn.
<i>E. cinerea</i> F. v. M.	<i>E. nitens</i> Maiden.
<i>E. eugenioides</i> Sieb.	<i>E. obliqua</i> L'Hérit.
<i>E. fastigata</i> D. & M.	<i>E. paniculata</i> Sm.
<i>E. globulus</i> Labill.	<i>E. pauciflora</i> Sieb.
<i>E. leucoxydon</i> F. v. M.	<i>E. saligna</i> Sm.
<i>E. leucoxydon</i> F. v. M. var. <i>Macrocarpa</i> J. E. Brown	<i>E. viminalis</i> Labill.
<i>E. macarthurii</i> D. & M.	<i>E. viminalis</i> x <i>E. macarthurii</i> hybrids

In Australia (I. Common, pers. comm.) this moth is recorded from *E. blakelyi* Maiden, *E. maculosa* R. T. Baker, *E. macrorhyncha* F. v. M., *E. regnans* F. v. M. and "probably feeds on many species." *Tristana* sp., peach (*Prunus persica* (L.) Batsch) and *S. molle* are also said to be attacked. Minko (1961) records that it has completed its life cycle on *Pinus radiata* D. Don., although apparently only after passing the early instars on eucalypts (Minko, pers. comm.).

Attempts to rear *A. eucalypti* from first instar on peach, apricot, silver birch, liquidambar and *P. radiata* at the Forest Research Institute, Rotorua, were not successful. It does, however, feed readily on *S. molle* and the 18 species of *Eucalyptus* listed in Table I.

#### Conclusion

It is impossible to forecast the eventual distribution, host range and economic importance of this insect in New Zealand. It appears to thrive equally well in lowland coastal areas, and inland at 360 to 400 m above sea level. Undoubtedly its spread at the hands of man, and its slower natural spread will continue.

The range of species of *Eucalyptus* already known to provide adequate food for the larvae suggests that it may be found attacking additional species.

In the past it has not been abundant enough to cause any concern, but in recent years there have been reports of severe attacks on a number of species of *Eucalyptus*.

In Melbourne and northeast Victoria *A. eucalypti* has two broods a year (Minko, pers. comm.). Should it become established at similar latitudes in North Auckland, where eucalypts are already numerous, it might be expected to have two broods there also. This, combined with the virtual absence of natural enemies, could result in *A. eucalypti* becoming a pest of some importance; particularly should eucalypts be more extensively planted both here and in areas where it is already firmly established.

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