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**Ecology of *Paropsis charybdis* Stål (Coleoptera: Chrysomelidae):  
A *Eucalyptus* defoliator in New Zealand**

A thesis presented in partial fulfilment  
of the requirements for the degree  
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## Abstract

*Paropsis charybdis* Stål (Coleoptera: Chrysomelidae), misidentified as *P. dilatata* Er. before 1963, seriously defoliates some *Eucalyptus* species in New Zealand. This study investigated the life history and phenology, behaviour, growth and development, population dynamics and host-plant interactions of *P. charybdis*, emphasising those aspects likely to affect biological control programmes.

*P. charybdis* in the central North Island had a bivoltine life history. Adults diapaused during winter. Low temperatures and probably changes in foliage characteristics were sufficient for induction of diapause but no single factor was necessary. Adults emerged in spring to lay eggs. Young *Eucalyptus* foliage was necessary for oviposition. Activity of adults was increased in the presence of volatiles from *E. viminalis* leaves but did not differ significantly between mature and young leaf treatments. Egg-laying ceased in midsummer but this was not caused by lack of new growth, nor by high defoliation. The pattern of abundance in summer was driven by oviposition and temperature and enhanced by intra-specific competition among early instars.

Density-dependent mortality occurred between eggs and 4th instars during the second generation and appeared to result from intra-specific competition for new growth. This was also the key stage that caused variation in summer mortality. Egg survival rates were 93-99%. Survival between eclosion and establishment of 1st instars on new foliage averaged 45% and was independent of density in an experiment where food was in excess. Mortality of the pre-pupal to teneral adult stages in the soil was 90%, but was independent of density in both generations.

Development rate-temperature relationships were described for larvae fed *E. viminalis* young adult foliage, and for eggs and pupae. A method was developed for minimising differences in duration among larvae grown at different temperatures, so that the effects of changes in food quality were obviated. The method appears widely applicable for development-rate studies.

Defoliation in a five-year old plantation of *Eucalyptus nitens* was almost twice as severe in the second *P. charybdis* generation as in the first. Shoot growth was significantly correlated with rainfall and defoliation intensity. There was a strong inverse relationship between defoliation intensity and deviations from the seasonal trend in rainfall.

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**Erratum:** Due to an error in numbering, Fig. 4.19 follows Fig. 4.17.  
However, all figures referred to in the text are present.