RECENT WORK IN EUROPE ON BIOLOGICAL
CONTROL OF *HYPERICUM PERFORATUM [GUTTIFERAE]*
FOR AUSTRALIA

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Additional climatically adapted strains of the chrysomelids *Chrysolina hyperici* Suffrian and *C. quadrigemina* Förster, the geometrid, *Anaitis efformata* Guenée, and the buprestid *Agrilus hyperici* Greutzer from submediterranean regions of France have been introduced into Australia for release in regions where *Hypericum perforatum* L. is still insufficiently controlled biologically. Further safety testing of the noctuid, *Actinotia hyperici* Schiffermeyer revealed that additional testing against *Eucalyptus* spp. would be necessary. The eriophyid, *Phyllocoptes hyperici* Liro, was found to be a major controlling agent for *H. perforatum* in France and preliminary safety testing strongly suggests it could be safe to introduce into Australia. In France the combined effect of *P. hyperici* and *Ag. hyperici* causes the decline of *H. perforatum* populations to low levels within 10 years in aging stands of the weed. The importance of these organisms and others in regulating populations of *H. perforatum* is discussed.

St. John’s wort, *Hypericum perforatum* L., was controlled biologically in parts of Australia by introduction of a group of insect species from southern France, the most important of which has been the chrysomelid defoliator, *Chrysolina quadrigemina* (Suffrian) (Wilson, 1943, 1960; Clark, 1953). The other chrysomelid established *Chrysolina hyperici* Förster, exists at much lower levels. Considerable reduction in infestation levels of the weed were observed in regions with a Mediterranean type climate and in open, undisturbed land. However, the beetles have had less effect in much of south-eastern Australia (including New South Wales, the Australian Capital Territory and Victoria), on weed populations on old gold dredgings (where there are few suitable aestivation sites for the beetles) and in areas where a combination of burning, afforestation, alternate cropping and abandonment occurs, and there is a lack of competing vegetation (Huffaker, 1967). Consequently, St. John’s wort still infests thousands of hectares of hilly country in Australia, especially from Tamworth, New South Wales, in the north, to Beechworth, Victoria, in the south. In those latter areas, higher altitudes with higher rainfall, and relatively dense stands of native trees (particularly *Eucalyptus* spp.) provide a habitat for St. John’s wort in which the present populations of *Chrysolina* spp. are ineffective. The presence of St. John’s wort in these areas significantly reduces their value for grazing (Delfosse &

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Cullen, 1981). The areas where the weed remains a problem in Australia do not have a true Mediterranean climate; instead of a long, dry summer followed by heavy autumn to winter rains, some summer months may have more rain than winter months. Huffaker (1967) has explained, in terms of the insect's life cycle, why the absence of a distinct summer drought leads to premature emergence from aestivation in advance of regeneration of the plant host, producing considerable mortality of the chrysomelids.

The aim of the program in Europe was two-fold: (1) to introduce new stocks of certain agents on *H. perforatum* from areas as climatically similar as possible to the regions at present heavily infested by St. John's wort in Australia and (2) to investigate other arthropods which could be of use in controlling the weed. Because *C. quadrigemina* is ineffective as a biological control agent under tree shade in Australia a study of natural *H. perforatum* infestations in shady situations in Europe was planned. However, for 2 reasons, this part of the program was not pursued. Firstly, even casual observation showed that defoliation by *Chrysolina* spp. often occurred under tree shade in Mediterranean and submediterranean Europe, notably within evergreen olive groves which most closely approximate, in amount and type of shading, *Eucalyptus* and *Acacia* stands in Australia. Secondly, whenever dense tree cover produced considerably more shading than that, *H. perforatum* populations declined rapidly as degree of shading increased within the stands. The weed is very rare within dense oak forests of Mediterranean and submediterranean Europe and is typically limited to disturbed, open situations with little shade.

The program therefore concentrated on introducing strains of *Hypericum* agents climatically better adapted to Australian conditions than those which had been previously released in Australia, testing further some agents that had not been released previously and investigating agents not previously studied.

In addition, during the study of 1 of these new agents (the eriophyid mite, *Phyllocoptes hyperici* Liro, and during observations at sites of the previously-introduced buprestid *Agrilus hyperici* (Creutzer), an understanding was obtained of the importance of these agents as natural regulators of *H. perforatum* populations in submediterranean Europe.

**Chrysolina** spp.

Two *Chrysolina* spp. were originally introduced and established in Australia for the control of *H. perforatum*. *C. quadrigemina*, the more successful, was introduced from the Mediterranean regions of south-eastern France (southern Var) whilst the strain of *C. hyperici* came from southern England (Wilson, 1960). The major infestations of *H. perforatum* in Australia now occur in submediterranean climates which are different from both of the above regions. Therefore, new strains of both *Chrysolina* spp. were collected in 4 main regions in France, from: (1) Haute Provence, (2) Northern Var, (3) Vaucluse and Drome, all to the north of the original collection area of *C. quadrigemina* in the southern Var and (4) just north of Montpellier where there is also a region of submediterranean climate. The regions selected vary from those with considerable summer drought (St Saturnin near Apt, and Forcalquier) to those with some summer rainfall and less summer drought, Reves-de-Bion near Sault and St. Bauzille near Montpellier (fig. 1). Most of the submediterranean regions of *H. perforatum* occurrence in Australia are matched by one or other of these areas. Many adults of both *Chrysolina* spp. were collected from and beneath *H. perforatum* at the sites indicated in figure 1 during late winter and early spring. Beetles were placed with leafy stems of *H. perforatum* in plastic sandwich boxes covered with filter paper inside and kept at room temperature (approx. 20 °C). Eggs of *Chrysolina* spp. were collected as they were laid and placed on slightly dampened filter paper and shipped in Petri dishes to Australia.