for routine weed control. However, after 10 to 12 weeks the residual dichlobenil in the soil was an order of magnitude less than the initial application. If *Elodea* is exposed to frost in the winter and the herbicide application is coincident with re-growth in the spring, perhaps it will be possible to achieve control with dichlobenil more economically, using lower dosages and with no increase in hazards.

RECENT TRENDS IN THE BIOLOGICAL CONTROL OF WEEDS IN VICTORIA

L. Schmidl
Department of Crown Lands and Survey, Victoria

Extensive developments in herbicides since the 1950s have produced effective methods of weed control. For most of the major weeds in Victoria, chemical control has become widely accepted, although, in many instances, it is inadequate, uneconomical and ecologically hazardous. For example, skeleton weed, *Chondrilla juncea*, ragwort, *Senecio jacobaea*, and blackberry, *Rubus fruticosus*, infest large areas, but are difficult to control by chemical means. Great mullein, *Verbascum thapsus*, occurs in difficult, low class hill country, where chemical control is economically prohibitive. Chemical treatment of boneseed, *Chrysanthemoides monilifera*, is undesirable, because of the risk to associated flora.

Because almost all noxious weeds in Victoria are introduced plants, there is a potential for biological control with introduced organisms. Interest in this technique has increased, due to problems associated with chemical control methods.

Biological control agents introduced by CSIRO for the control of skeleton weed show some impact on this plant. The most effective agent so far is the rust fungus, *Puccinia chondrillina*, which, since its release in 1971 has become widespread and has reduced many populations of skeleton weed to manageable levels. The rust has spread spontaneously and extensively, and few artificial introductions to isolated infestations are necessary. However, *P. chondrillina* affects only the most common Type A

skeleton weed, leaving Types B and C unaffected. The gall midge, *Cystiphora schmidtii*, released in 1971, has increased in some areas extensively in 1974-75. The gall mite, *Aceria chondrillae*, has been introduced into the field but no spread has been reported.

Biological control of ragwort has so far been unsuccessful in Victoria. The cinnabar moth, *Callimorpha jacobaeae*, has failed to become established because of disease, predators and parasites. Establishment may be possible by the use of disease-free or disease-resistant strains of the moth from Canada, where the species has become established. Other insects are also being considered as possible control agents.

Overseas investigations suggest that the blackberry problem in Victoria could possibly be reduced by the introduction of the parasitic fungus *Phragmidium violaceum*. Preliminary work has been commenced overseas to test it on two of our *Rubus* species. It is intended to extend this work and to explore the complete range of biological control agents of blackberry in Europe.

A survey in 1972-73 by the Commonwealth Institute of Biological Control in Europe showed that *Verbascum* spp. are hosts to several phytophagous insects and it appears that some may have good potential for the biological control of great mullein, *V. thapsus* (pers. comm. D. Schröder, Delemont).

In the past, at least in Victoria, only sporadic efforts have been made to investigate the control of weeds by biological means. There is no doubt that herbicides have their rightful place in an integrated weed control system but there is an urgent need to look more closely at alternative methods, including biological control.