HOST SPECIFICITY TESTING AND SUITABILITY
OF THE PARASITOID MICROCTONUS HYPERODAE (HYM. :
BRACONIDAE, EUPHORINAE) AS A BIOLOGICAL CONTROL AGENT
OF LISTRONOTUS BONARIENSIS (COL. :
CURCULIONIDAE) IN NEW ZEALAND


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The behaviour of the parasitoid Microctonus hyperodae Loan was studied under quarantine conditions to determine its likely host range in New Zealand. The species was imported from South America as a potential biological control agent of Argentine stem weevil, Listronotus bonariensis (Kuschel).

The study involved systematic evaluation of the parasitoid's behaviour when exposed to 24 non-host weevil species; all but three of these were native to New Zealand. Of those tested, four were found to sustain some M. hyperodae development. However, further examination showed that in all but one species, Irenimus aequalis (Broun), parasitoid development was impeded, with up to 50% of the larvae becoming encapsulated. Overall, those weevil species that were attacked produced only 19% of the parasitoids derived from L. bonariensis controls.

As an adjunct to this quarantine study, a review of the habitats of the native weevil and target pest populations indicated that refugia would probably exist for native alpine species.

I. aequalis was not considered to be threatened by M. hyperodae as this weevil has benefited from the advent of European agricultural systems to the extent that it is now recognised as a minor pest. In view of its relatively oligophagous behaviour, the parasitoid was recommended as suitable for release.

KEY-WORDS : Microctonus hyperodae, New Zealand, host range, habitat separation.
releasing the parasitoid *Trigonospila brevifacies* (Hardy) (Diptera: Tachinidae) against tortricid apple orchard pests has been challenged (Roberts, 1986). The polyphagous nature of this species may be seen to threaten native Lepidoptera (Roberts, 1986). Ironically, a wide host range was until quite recently seen to be desirable as it allowed a biological control agent to exist on other species when the target species were scarce (e.g. De Bach & Bartlett, 1964). It is with an appreciation of this increased environmental awareness that new biological control programmes, such as that discussed in this contribution against *Listronotus bonariensis* (Kuschel) (Coleoptera: Curculionidae), are now being instigated in New Zealand.

*L. bonariensis* is one of the New Zealand’s severest pests of Graminae (e.g., May, 1961; Pottinger, 1961). First collected in New Zealand in 1927 (Marshall, 1937), it is currently estimated to cause losses to the country’s pastoral industry of NZ$78-NZ$250 million p.a. (Prestidge *et al.*, 1991). Additionally, the weevil may damage wheat (Blair & Morrison, 1949). In view of the obvious importance of this species, considerable research has been conducted into its biology and population ecology; these aspects are now relatively well understood (e.g., Pottinger, 1961; Goldson, 1981a; Barker, *et al*. 1989). This work has shown that pesticides are of only limited value in controlling *L. bonariensis* in pasture because of the sheltered nature of the species’ larval mining habit, the adults’ substantial dispersive capability (e.g., Pottinger, 1966; Goldson, 1981b) and pasture’s relatively low economic return per hectare. Conversely, considerable progress has been made in the development of resistant pasture cultivars based on the endophytic fungus *Acremonium lolii* Latch, Christensen and Samuels (e.g. Pottinger *et al.*, 1985). Unfortunately, such resistance can produce stock health problems (reviewed by Prestidge, 1990) and good reason exists therefore to integrate biological control agents into an overall *L. bonariensis* management strategy. To this effect, populations of the parasitoid *Microctonus hyperodae* Loan (Hymenoptera: Braconidae; Euphorinae) were recently collected from diverse a range of ecoclimatic zones in its primitive South American habitat and imported into New Zealand quarantine (Goldson *et al.*, 1990a). However, apart from the published contribution of Loan & Lloyd (1974), not much was known about the behaviour of *M. hyperodae* and nothing about its likely interaction with foreign Curculionidae. Furthermore, a review of the literature revealed little about quarantine-based methods to redress this, in spite of biological control scientists’ obvious need for such information (e.g., Howarth, 1991). Therefore it became apparent that appropriate research was required to define the criteria which permit optimum pest suppression with minimum environmental risk. This report describes the application of an approach to host range assessment discussed earlier by Goldson & Phillips (1990) in order to evaluate the suitability of the parasitoid *M. hyperodae* as a potential control agent of *L. bonariensis*.

**METHODS AND MATERIALS**

Since this study was broadly based on the approach discussed by Goldson & Phillips (1990), it may be sub-divided as follows:

**LITERATURE-BASED SELECTION OF A CONTROL AGENT AND ASSESSMENT OF ITS SUITABILITY**

A review of the literature revealed *M. hyperodae* to be a promising biological control candidate based on the work of Loan & Lloyd (1974). The parasitoid attacks the adult stage of *L. bonariensis*, thus precluding oviposition and development of destructive larvae. Additionally, Loan & Lloyd (1974) noted that under field conditions *M. hyperodae* only