

PROGRESS REPORT ON BIOLOGICAL CONTROL OF NODDING THISTLE (*CARDUUS NUTANS*) IN NEW ZEALAND

C.T. Jessep¹

ABSTRACT

Nodding thistle is a serious weed in New Zealand. Control requirements under the New Zealand Noxious Weeds Act result in costly weedicide application. Inherent characteristics of the plant, particularly seed germination time, make nodding thistle very difficult to control chemically. The nodding thistle receptacle weevil, *Rhinocyllus conicus* (Froel.), introduced into New Zealand in 1973, from Canada, has been successfully established. Studies checking synchronization, adaptation, longevity, fecundity and host plant seed reduction indicate that *R. conicus* will exert considerable pressures on nodding thistle. Another weevil, *Trichosirocalus* (= *Ceuthorrhynchidius*) *horridus* (Panzer), from Rome, which is at present under quarantine conditions, should provide complementary control.

INTRODUCTION

Nodding thistle, *Carduus nutans* L., first recorded in New Zealand in 1899, is now a major weed problem throughout a large proportion of the country, in pasture and pasture-related situations. Because this weed is gazetted under the New Zealand Noxious Weeds' Act it is subjected to strong control pressures by Noxious Plants Officers who usually emphasize control by chemical means. Successful chemical treatment apart from massive costs, presents a very real problem of timing application for maximum thistle control with minimum damage to pasture. Nodding thistle seeds do not have a season-related maturation period, they germinate throughout the year according to availability of moisture. Cost generally precludes a repeat weedicide application, therefore many plants survive.

In 1972 and 1974, Entomology Division, D.S.I.R., imported from Dr. P. Harris in Canada, two consignments of the receptacle-feeding weevil *Rhinocyllus conicus* (Froel.) (Harris and Zwolfer 1971). After being rephased to southern hemisphere seasons, these weevils have readily established throughout New Zealand (Figure 1). All four representatives of the genus *Carduus* in New Zealand—nodding thistle (*C. nutans*), plumeless thistle (*C. acanthoides* L.), winged thistle (*C. tenuiflorus* Curt.) and slender-winged thistle (*C. pycnocephalus* L.)—are acceptable hosts.

The following factors on biology of nodding thistle have been observed:

- Nodding thistle is an annual.
- Plants can be found in flower throughout the year but the main flowering period is between November and January.
- Cross-pollination is necessary.
- Plants can produce up to 18 000 seeds.
- Seeds can germinate at any time of year provided sufficient moisture is available.
- Seedling survival rate is best when other plant competition is low.
- Physically damaged plants become very persistent and long-lived.

Studies of *R. conicus* in New Zealand show that:

- Synchronization of the weevil to the plant in the southern hemisphere is good.

¹ Entomology Division, D.S.I.R., Lincoln Research Centre, Private Bag, Christchurch, New Zealand.

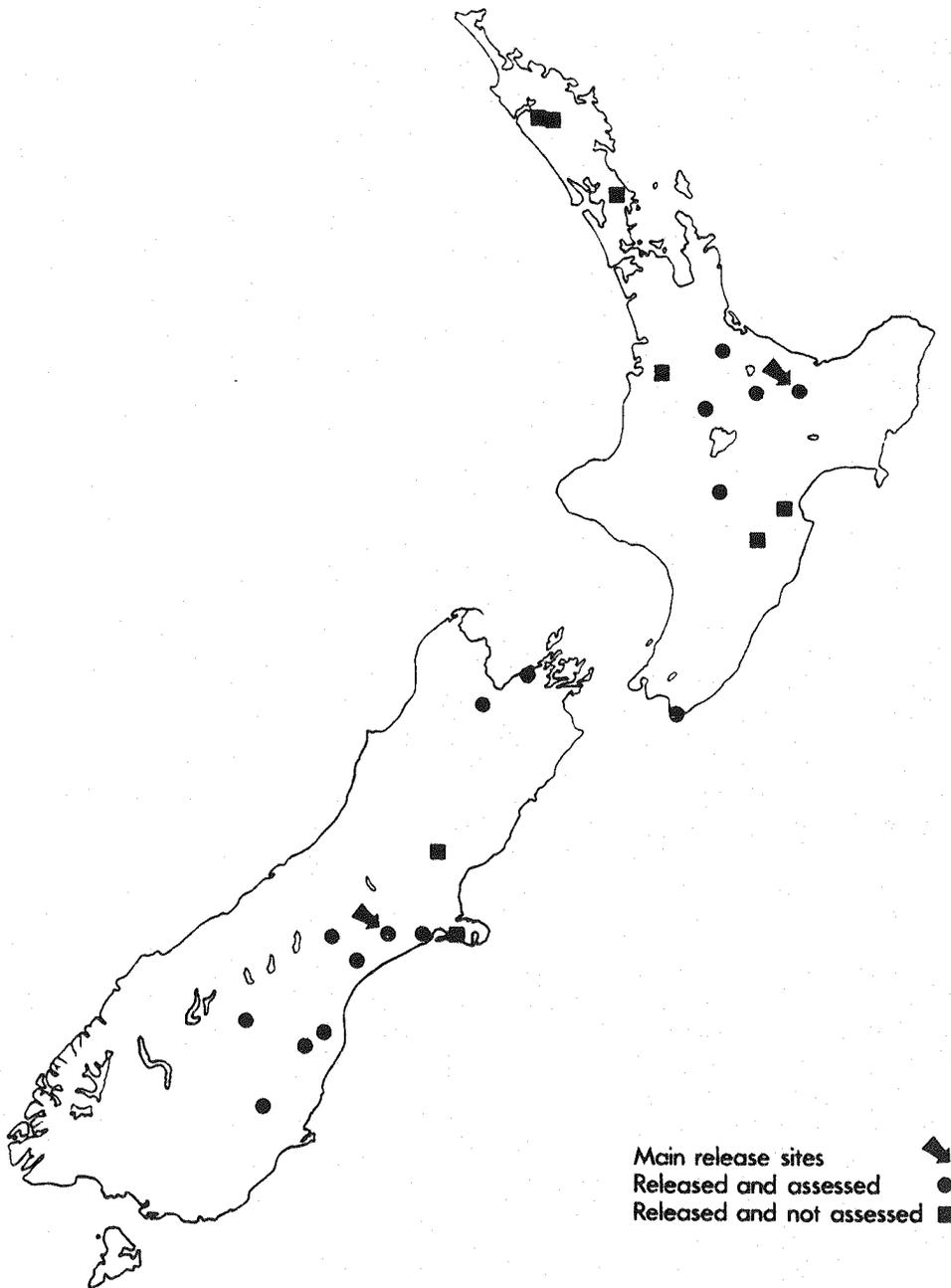


Figure 1. *Rhinocyllus conicus* on *Carduus nutans* in New Zealand, 1980.

- Climatic factors have not inhibited its spread throughout the range of its host.
- Adult feeding has no adverse impact on the plant.
- Preferred oviposition site is on the involucre.
- Females can produce 360 eggs but the mean is 200.
- Ninety-two per cent of eggs are deposited on thistle buds compared with 7 per cent on immature heads and 1 per cent on fully opened inflorescences.
- Seventy per cent of eggs survive to become adults.
- The receptacle of a primary inflorescence is capable of supporting to maturity 25 larvae.
- Six larvae feeding within a receptacle will reduce seed production by 85 per cent.
- Longevity of adults is up to 15 months.
- There are two generations in some areas.
- *R. conicus* attack on nodding thistle is very subtle. Some existing forms of control, e.g. mowing and overgrazing tend to stimulate persistent thistle regrowth, but even high densities of larvae feeding within the receptacles do not produce this effect.
- Predators are not a serious problem.
- Parasitism, to date, is of no consequence.
- *R. conicus* will have a marked controlling influence on nodding thistle populations.
- Physical size relationship between *R. conicus* larvae and the receptacle diameter of the two winged thistles leads to complete inflorescence destruction before many of the larvae reach maturity. Survival rate (eggs to adults) from these two thistles is approximately 8 per cent.

Further research has shown that by introducing the crown-rot weevil *Trichosirocalus* (= *Ceuthorrhynchidius*) *horridus* (Panzer), nodding thistle would be exposed to predation for a greater portion of the year. This is still in the preliminary phase.

In the South Island, N.Z., natural dispersal of *R. conicus* to most nodding thistle infestations within a radius of 50 km from the original release site has been achieved in six years. The weevil population at one North Island release site is now at the level where very few secondary as well as primary inflorescences escape a significant burden of eggs.

Successful survival and dispersal of *R. conicus* in New Zealand indicates that this weevil will have a major impact on *C. nutans* plant populations.

REFERENCE

Harris, P., and Zwolfer, H. (1971). *Carduus acanthoides* L., warty thistle, and *C. nutans* L., nodding thistle (Compositae). In 'Biological Control Programmes Against Insects and Weeds in Canada 1959-68'. Tech. Commun. Commonw. Inst. Biol. Control 4:76-9.