

THE EFFECT OF BIOLOGICAL CONTROL AGENTS ON WEEDY CACTI IN WESTERN AUSTRALIA

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Summary. The cochineal scale insect, *Dactylopius opuntiae*, successfully controlled infestations of common pest pear, *Opuntia stricta* var. *stricta*, on islands within two years of release, but failed to establish on common pest pear on the nearby mainland in the Pilbara region. Recent releases of cochineal scale and cactoblastis moth, *Cactoblastis cactorum*, at Geraldton appear not to have established.

INTRODUCTION

The Agriculture Protection Board of W.A. (A.P.B.) recognizes the role of biological control agents with noxious weeds and is currently involved in biocontrol programmes with Paterson's curse (2) and Parkinsonia (9). This paper reports the progress of biological control agents with weedy cacti infestations where chemical and mechanical control were considered inappropriate.

Weedy *Opuntia* spp., widespread in eastern Australia (4), have proved to be very damaging over large areas. In 1926, 24 million hectares were affected by common pest pear with about half this area being rendered unproductive (1). Biological control agents have been used since the 1920's (5). *C. cactorum* has been the most successful biological control agent in Australia especially where common pest pear grew amongst scrub or occurred as small infestations (5). Elsewhere in the world, biological control of weedy cacti has been more successful with *Dactylopius* spp. rather than with *Cactoblastis* spp. (6).

Opuntia spp. are declared plants (noxious weeds) in Western Australia (W.A.) north of the 26th parallel of latitude. The declaration of these cacti was invoked as a pre-emptive measure because of the widespread problems caused by *Opuntia* spp. in eastern Australia. W.A. has few problems associated with weedy cacti, only *O. stricta* and *O. vulgaris* being recorded (3). Consequently there has been minimal control activity and no significant damage to agricultural or pastoral lands. Small outbreaks have been treated chemically and no biological control on cactus was attempted prior to 1984.

METHODS

Biological control agents were released in two regions with weedy *Opuntia* spp. The locations of the infestations (Fig. 1) and the progress of the agents were reported by officers of the A.P.B.

The Pilbara region infestations of common pest pear (Fripp, unpublished) on East and West Lewis Islands, in the Dampier Archipelago, north-west of Dampier, were treated with cochineal scale. The cactus was thought to have originated near some old cattle yards on West Lewis Island where it was planted by sailors, as an emergency food source (M.Minchin, pers. comm., 1990) and had spread to the sandhills above the high tide mark. The Lewis Islands are vested in the National Parks and Conservation Authority for conservation of flora and fauna and recreation purposes. The presence of these infestations within conservation reserves was undesirable.

The Lewis Islands experience an arid environment similar to that of Roebourne (50 kms to the east) which has average annual maximum and minimum temperatures of 33°C and 20°C respectively and an average annual rainfall of 310 mm (8). Parts of the islands were inaccessible, rendering chemical and mechanical control inappropriate. Biological control was considered as an alternative treatment. The cochineal scale, from the N.S.W. Department of Agriculture, Agricultural Research Centre, Tamworth, was multiplied in a nursery for 6 months prior to release.

These insects were released into about 0.5 ha of the common pest pear in October 1984, on the eastern side of West Lewis Island. A further introduction was undertaken in October 1986 when infested cactus pads were dropped from a helicopter on all other infestations on the Lewis Islands (Minchin, unpublished).

Cochineal scale was also released into Pilbara mainland infestations of common pest pear at the Roebourne common, in May 1985. The Roebourne common adjoins the Roebourne townsite and is more than 5 kms from the sea.

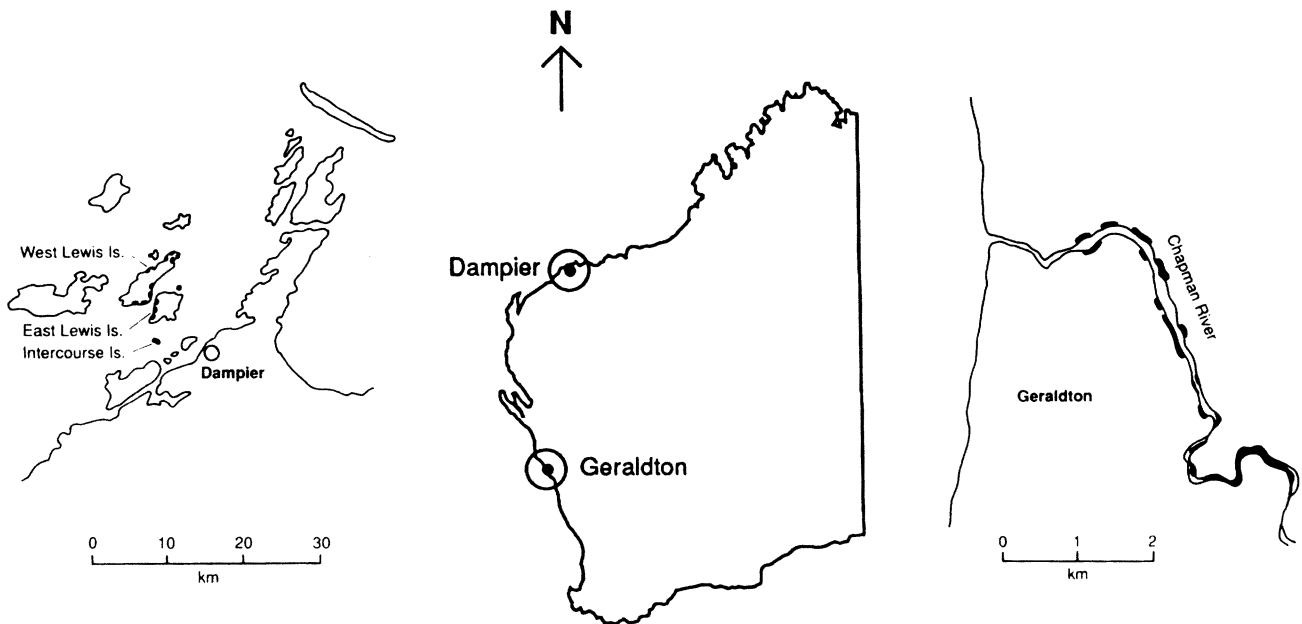


Figure 1. Biological control sites for weedy *Opuntia* spp. in W.A.

In the Geraldton region, a mixed infestation of two species of weedy *Opuntia* spp., common pest pear and possibly *O. elatior* (Dodd, unpublished), was treated with both cochineal scale, from the Lewis Islands and cactoblastis larvae from Tamworth, N.S.W. Nomenclature used for the two cactus species corresponds to that used by Telford (7) where both species are described.

The infestation grew in native vegetation along five kms of the Chapman River ending one km east of the river mouth (Fig. 1). The infestation appears to have originated from plant fragments transported down the Chapman River from a homestead garden. No invasion of cultivated land had occurred. The climatic conditions at this site are milder than those experienced at the Lewis Islands. The average annual maximum and minimum temperatures are 25°C and 15°C respectively and average annual rainfall is 450 mm for Geraldton (8).

Biological control agents were released at this site because chemical control was expensive, \$150 per ha, and individual cactus plants were often difficult to locate amongst the scrub. Cactoblastis larvae and cochineal scale were released direct onto the Chapman River infestation without being multiplied under nursery conditions. Six cactus pads with cochineal scale were released in May 1989, one pad per plant, and cactoblastis larvae were released onto platforms of pads in the centres of two plants in September 1989.

RESULTS AND DISCUSSION

a) Pilbara region. Stands of common pest pear on the Lewis Islands were successfully colonised and controlled by the cochineal scale insect. Eight months after the cochineal was released it was found up to 10 m from the release site. The initial 0.5 ha site was 90 per cent destroyed following a further 15 months, with only a few plants remaining. At the same time, cochineal was found to have spread across 500 m of sea to the western shore of East Lewis Island. The effect of the second introduction, by helicopter, is unknown as natural spread had also occurred. It was, however, found that cochineal had spread to an infestation of common pest pear on Intercourse Island, approximately 3 kms from the closest neighbouring population of cochineal (Minchin, unpublished) in June, 1987. Cochineal is a successful agent in hot, dry areas (4) and it has been effective in the extremely arid, salty and hot environment of the Dampier Archipelago.

Cochineal did not establish on common pest pear on the mainland at the Roebourne common, an arid and hot environment (Minchin, unpublished). Insect and avian predation may be more prevalent away from the littoral environment.

b) Geraldton region. In December 1989 the pads that were infested with cochineal and placed in the cactus infestation in May 1989 were broken down and there was no sign of the scale. Similarly, the sites where the cactoblastis were placed in September 1989 showed no sign of insect damage three months later. Neither agent could be found in April 1990 and there was no sign of damage that could be attributed to either species (R.Chant, pers. comm., 1990). Environmental conditions are likely to be suitable for both agents; consequently further releases are planned. Bulking up and acclimatisation of the insects will be attempted prior to any subsequent release.

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