

## **Herbivores and pathogens associated with *Clianthus* species (Fabales: Fabaceae)**

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### **Abstract**

*Clianthus* is an endemic genus of only two species, *C. punicens* (G. Don) Sol. Ex Lindl. and *C. maximus* Colenso, both of which are endangered (Heenan 2000). Information about the herbivores that feed on these species and pathogens that attack them was obtained from literature, Landcare Research fungal databases and field observations. Two pathogens are associated with roots and two with stems and the crown, while a powdery mildew, *Oidium* sp., is seen on leaves. The commonest of three herbivorous mites found on *Clianthus* is the endemic species, *Aceria clianthi* (Eriophyidae). This mite is only found on *Clianthus* and should be regarded as endangered. Eleven species of insects, in the orders Coleoptera (3), Diptera (1), Hemiptera (5) and Lepidoptera (2), and one species of mollusc are associated with *Clianthus*. The endemic leaf mining fly, *Liriomyza clianthi* (Agromyzidae) and the adventive mollusc, *Cantareus aspersus* (Gastropoda: Helicidae), can defoliate plants in the Auckland gardens and reduce the life span of plants.

### **Introduction**

There are two species of the New Zealand endemic genus *Clianthus* (Fabaceae) - *C. punicens* (G. Don) Sol. Ex Lindl. and *C. maximus* Colenso (Heenan 2000). The former is only known from an island in the Kaipara Harbour and in cultivation, while the latter is known from several eastern areas of the North Island. Both species, which are commonly called kaka beak, are regarded as endangered, with *C. maximus* classified as vulnerable and *C. punicens* as critically endangered, although *C. punicens* is believed to be widely planted in gardens. Very little is known about the herbivore fauna of plants in the wild, whereas there are observations of the fauna and pathogens on plants in gardens. Because of the recent reclassification of the genus (Heenan 2000), observations made before 2000 and some after this date cannot be reliably associated with either plant species.

This paper is an update of a paper written for Department of Conservation (DoC) (Martin 2003) and includes recent observations of herbivores on *C. punicens* and information currently in the Plant-SyNZ herbivore-host plant database ([www.crop.cri.nz/home/plant-synz/index.jsp](http://www.crop.cri.nz/home/plant-synz/index.jsp)).

## Methods

Sources of information for this paper include the literature, a database of Tortricidae (Lepidoptera) and their host plants assembled by John Dugdale for HortResearch in 1994, my own observations of plants in gardens, and the observations of other people. Information on pathogens came from the PDD (Plant Diseases Division) herbarium database at Landcare Research and the Landcare Research fungal literature database.

## Results

### Acari

Three species of herbivorous mites are associated with *Clianthus*.

#### *Aceria clianthi* Lamb, 1952 (Acari: Eriophyidae)

This gall mite has been confirmed on *C. maximus* and *C. punicens* (N.A. Martin, unpublished data) although most of the records examined were for *Clianthus* sp. In addition, *A. clianthi* was found once on *Lotus cornulatus* (Fabaceae) near where kaka beak had recently been growing (Manson 1984). Feeding by this endemic mite causes *Clianthus* plants to produce deformed growths (Lamb 1952). In its more extreme form, clusters of deformed shoots create a so-called “witches’ broom”. Young leaves become distorted with hairy growths in the areas affected. This type of damage is particularly common in Auckland. Feeding by the mite also damages inflorescences and shoots. Witches brooms were observed in 2008 on plants of both species in the Christchurch Botanic Gardens (N.A. Martin unpublished data).

Manson (1984) recorded the mite from Auckland, Napier, Palmerston North, Wellington, Christchurch, near Port Chalmers and Invercargill. During the last 10 years I have seen damage and mites in the Christchurch Botanic Gardens, a garden in Palmerston North and Mount Albert Research Centre. The latter infestation showed up 12 months after the shrubs were planted. No signs of damage have been seen on plants in a garden in New Lynn, Auckland, or in the Auckland Botanic Gardens.

Two predators have been reported associated with the eriophyid mite by A.C. Eyles (*personal communication*). He observed predators (*Sejanus albisignatus* (Knight 1938) (Hemiptera: Miridae)) probing and apparently feeding among the distorted leaves where eriophyid mites were located. Also present was a yellow predatory mite species, *Agistemus collyerae* Gonzalez 1963 (Stigmaeidae), a species commonly found on shrubs and trees.

*Aceria clianthi* is normally found only on *Clianthus* spp., and because its host plants are classified as endangered, this herbivore should also be classified as endangered.

#### *Bryobia repensi* Manson 1967 (Acari: Tetranychidae)

This species was recorded by Manson (1987) from *Clianthus*. A *Bryobia* species was

found during the present study in Auckland on the lower leaves of a *C. punicens* that was losing leaves and branches, but the species of mite has not been determined.

*Tetranychus urticae* Koch 1836 (Acari: Tetranychidae)

This species was also recorded by Manson (1987) from *Clianthus*, but no microscope slides of this mite from this plant genus were found in a recent examination of Tetranychidae specimens in New Zealand (Z.-Q. Zhang, *personal communication*).

#### **Insecta: Coleoptera**

*Oemona hirta* (Fabricius 1775) (Coleoptera: Cerambycidae), lemon tree borer

Larvae were recorded in a dead branch of *Clianthus* (J. Bain 2007, ENSIS Forest Health database). Dead branches caused by Cerambycidae appear to be uncommon.

*Phymatus phymatodes* (Redtenbacher 1868) (Coleoptera: Anthribidae)

The beetle larvae tunnel in dead stems and branches and an adult was reared from *Clianthus* (Holloway 1982).

*Peristoreus* sp. (Coleoptera: Curculionidae)

One shaded bush of *C. punicens* in the Christchurch Botanic Gardens had leaves with short white 'mines' typical of adult weevil damage seen on *Carmichaelia odorata* Hook. f. (Fabaceae). An adult weevil found on the plant made similar feeding damage on a young leaf of *C. punicens* in the laboratory.

#### **Insecta: Diptera**

*Liriomyza clianthi* (Watt, 1923) (Diptera: Agromyzidae)

This leaf mining fly has been confirmed on *C. maximus* and *C. punicens* (N.A. Martin, unpublished data). The adult females and larvae can cause severe damage to *Clianthus* plants. Adult female flies puncture young expanding leaves with their ovipositor and feed on the fluids exuding from the damaged tissue. They lay a single egg in some of the holes. On hatching from the egg, the larvae tunnel into the leaf, feeding on the leaf tissue as they do so, and creating a distinctive mine. When larvae reach full size they cut a slit in the epidermis of the leaf and drop to the ground where they pupate in the leaf litter or soil. Mines with actively feeding larvae are found in expanding or recently fully expanded leaves.

The fly appears to be able to breed all year round in Auckland. Numbers of flies are lowest in late summer and early autumn. This may be due to the effects of parasites and other natural enemies, dry soil conditions for pupae or a summer resting stage. New mines are seen in autumn when *Clianthus* plants produce new leaves in response to autumn rain. Populations of flies can build up during the winter so that by spring numbers may be so high that feeding by adult female flies kills all new leaves before they can fully expand. At slightly lower population levels, any new leaves are killed by

larvae trying to mine them. In Auckland suburbs the plants are likely to be killed by the flies after two or three growing seasons and only one or two spring flowerings can be expected. Wise (1953) reported that leaf-mining damage to *Clianthus* plants in gardens could be so severe that the plant was most difficult to grow in some areas.

My observations in Christchurch Botanic Gardens indicate that fly populations are much lower. There is a winter generation, but it appears to last longer than in Auckland. It seems that the spring generation starts later and may experience higher parasitism than the earlier spring generation in Auckland. Parasitism in Christchurch is relatively high in late spring and early summer. Plants in Christchurch appear to be several years old and to flower for several seasons and not die early due to leaf miner fly damage as happens in Auckland.

The adult fly appears to have a good ability to find host plants, which include several *Carmichaelia* spp. (Spenser 1976).

Several hymenopterous parasitoids have been reared from leaf mines in kaka beak growing in Auckland and Christchurch suburbs. These are:

*Opius* sp. (Braconidae), larval/pupal parasite;

*Chrysocharis pubicornis* (Zetterstedt 1838) (Eulophidae), polyphagous, mainly a pupal parasite;

*Chrysonotomyia* spp. (Eulophidae), polyphagous larval parasite;

*Diglyphus isaea* (Walker 1838) (Eulophidae), polyphagous larval parasite that kills small larvae;

*Hemitarsoenus* sp. (Eulophidae), polyphagous larval parasite;

*Proacrias* n. sp. (Eulophidae), polyphagous larval parasite that may be a New Zealand species.

Most of these parasitoids are not active during the winter. In indigenous ecosystems, indigenous Agromyzidae are attacked by parasitoids (presumably indigenous species) that are active during the winter.

#### **Insecta: Hemiptera**

*Acyrtosiphon pisum* (Harris 1776) (Hemiptera: Aphididae) pea aphid

A colony of this aphid was found on *Clianthus*. Aphids were uncommon.

*Nezara viridula* (Linnaeus 1758) (Hemiptera: Pentatomidae), green vegetable bug

This species was found on *Clianthus* in a New Lynn garden where green vegetable bugs were breeding on other plants. Adults and juveniles fed on young shoot tips, causing growth to be deformed or stunted. This was particularly damaging in the late summer when plants were forming new shoots and leaves after a period of no growth associated with dry weather.

All life stages, including first instar nymphs, were found on kaka beak, suggesting that it is a host of green vegetable bug and is not casually associated with stray nymphs and adults.

*Paracoccus glaucus* (Maskell 1879) (Hemiptera: Pseudococcidae) mealy bug

There is only one record of a mealybug on *Clianthus* (as *punicens*) (Spiller & Wise 1982 – *Dactyopius glaucus* in Kirk 1906). The most recent major study of New Zealand mealybugs (Cox 1987) records no mealybugs from either *Clianthus* spp. and this and my own observations suggest that the kaka beak species are not normally host to these insects.

*Psylla (Acizzia) albizziae* Ferris & Klyver 1932 (Hemiptera: Psyllidae)

Spiller & Wise (1982) list *Clianthus* (as *punicens*) as a host plant of this psyllid. However, the cited reference (Tuthill 1952) states that only adults were found on the plant. No psyllids have subsequently been recorded from *Clianthus*.

*Sidnia kinbergi* (Stal 1859) (= *Eurystylus australis* Poppius) (Hemiptera: Miridae), Australian crop mirid

This hemipteran tends to feed on young plant growths such as shoot tips. Adults only were seen on plants in New Lynn. Plants do not appear to be attacked every year.

*Zygina zealandica* (Myers 1923) (Hemiptera: Cicadellidae)

Adults and nymphs were found on plants with speckling on leaves of plants in an Auckland suburb (N. A. Martin 2005, identified by M-C. Lariviere). This native plant hopper was abundant on nearby *Sophora* sp. and *Entelia arborescens* and the characteristic leaf speckling was seen on plants that were old or showing signs of ill thrift. Adults and nymphs were on the underside of leaves.

#### **Insecta: Lepidoptera**

*Ctenopseustis obliquana* (Walker 1863) and *Pyrgotis plagiatana* (Walker 1863) (Tortricidae) have each been reared from the genus *Clianthus* (J. Dugdale 1994, Tortricid host plant database).

Leaf roller damage was not seen on kaka beak in gardens.

*Orgyia thyellina* Butler 1881 (Lepidoptera: Lymantriidae), white-spotted tussock moth  
These larvae were found feeding on *Clianthus* during a recent incursion, and prior to their eradication (Hoare 2001).

#### **Mollusca**

*Cantareus aspersus* (Muller 1774) (= *Helix aspersa* Muller 1774) (Gastropoda: Helicidae), brown garden snail

The brown garden snail commonly feeds on kaka beak in Auckland, where they can defoliate and kill plants. They appeared to feed preferentially on young growth and, if uncontrolled, will prevent plants from producing new leaves and shoots (N.A. Martin, unpublished observations). The snails 'roost' in bushes.

### **Fungi**

The following records of fungi on *Clianthus* were found.

*Cylindrocladium scoparium* Morgan. (PDD herbarium database) root rot (ARC Botanical Gardens).

*Fusarium sambucinum* Fuckel /*Gibberella pulicaris* (Fr.) Sacc. (Gadgil 2005, page 170) root rot occasionally recorded from forest nurseries.

*Oidium* sp. (powdery mildew) (PDD herbarium database) leaf pathogen (Auckland).

*Sclerotinia minor* Jagger. One record (Landcare Research fungal literature database) where infection caused death of plant in Auckland (Boesewinkel 1977: 588).

*Sclerotinia sclerotiorum* (Lib.) de Bary. (PDD herbarium database) stem blight (Auckland).

Two of the five fungi associated with kaka beak cause root rots and two cause stem blight or crown rot. The fifth, *Oidium*, damages leaves and was also seen in an Auckland garden where it did not appear to cause significant leaf damage or leaf loss.

### **Acknowledgement**

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