

# A Guide to Willow Sawfly (*Nematus oligospilus*) in New Zealand

JG Charles, DJ Allan, KJ Froud and LE Fung

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## Introduction

*Nematus oligospilus*, a sawfly that feeds exclusively on willows, was discovered in Auckland in February 1997. Adults disperse rapidly by flight, and by the autumn of 1997 the species had been reported in Rotorua. By April 1998 larvae were widespread in the Bay of Plenty and Poverty Bay, where large numbers were found to be damaging several different willow types.

The larvae are external leaf-feeders, with a demonstrated ability in other countries to defoliate and even kill willow trees. This new pest poses a threat to soil stabilisation and river bank erosion control programmes, which rely on relatively few species and cultivars of willow, most of which have been bred in New Zealand over the past 30 years.

The Plant Materials Research Collective, a grouping of Regional and District Councils with a commitment to using plant materials for soil conservation, organised a workshop to inform Regional Councils of the current situation and discuss what measures should be taken. The workshop was held at Environment Bay of Plenty, Whakatane on 4 November 1998. Following the workshop it was decided that an identification kit should be produced and made available to all Regional Councils that utilise willow plantings. This booklet is designed to serve as an aid to rapid identification of the sawfly and "typical" damage to willows.

## Background

Since its discovery in Auckland, a number of reports have documented the sawfly's likely impact, subsequent spread to other areas and other research that has been undertaken by HortResearch. A brief summary of the more pertinent findings is given below. Those wishing for more detailed information should refer to Baker *et al.* (1997), Cowley and Whyte (1997), Charles and Froud (1997) and Charles and Allan (1998).

### Worldwide Distribution

Willow sawfly (*Nematus oligospilus*) is a widely distributed Northern Hemisphere species, it is found in Ireland, Britain, continental Europe to the Himalayas, and North America from Alaska to Mexico.

In the Southern Hemisphere (which contains few native willow species), the sawfly was found for the first time in southern Africa in 1993/94. A sawfly previously identified as *N. desantisi* (but probably the same species) was found in South America, Argentina about 1980. In both areas, large defoliations have been recorded.

### Willow Sawfly in New Zealand

As noted above, the sawfly was first discovered in February 1997 following heavy defoliation of tree willows, and was widely distributed in the Auckland isthmus. It is likely that the sawfly had been New Zealand for some time prior to this outbreak.

By late summer/autumn 1997 the sawfly had been found in Rotorua, and possibly Tauranga and Gisborne (these last sightings were not positively identified).

In the following summer the sawfly was found in Opotiki (December 1997) and around Gisborne (March 1998) where heavy defoliation had taken place. Numbers in the Auckland area were, by contrast with the previous summer, generally much lower.

### Dispersal

Adult sawflies disperse rapidly by flight. Based upon overseas experience and the rate of spread in New Zealand, it is expected that the sawfly will be able to spread throughout the country within five years from present (1999):

- 1997: Auckland
- 1998: Gisborne
- 1999: Hawkes Bay
- 2000: Wellington
- 2004: Invercargill

It appears unlikely that climatic conditions will limit the spread of sawfly in New Zealand.

### Damage and Host Range

Larvae have been found on at least the following willows in New Zealand:

Common name	Scientific name
Crack willow	<i>Salix fragilis</i>
Twisted, corkscrew, or tortured willow	<i>S. matsudana</i> 'Tortuosa'
Peking or matsudana willow	<i>S. matsudana</i>
Weeping willow	<i>S. babylonica</i>
Pencil willow	<i>S. humboldtiana</i> cv <i>Chilensis</i>
Golden willow	<i>S. alba</i> var. <i>vitellina</i>

As well as hybrid willows such as *S. matsudana* x *S. alba* (e.g. 'Tangoio', 'Moutere', 'Aokautere'), and natural hybrids of golden and crack willow. It has not been found on any species of *Populus*.

Laboratory trials indicate that tree willows (subgenus *Salix Salix*) are susceptible to damage. Adult sawflies have been found to lay eggs in the leaves of 23 tree willow genotypes. Shrub willows (subgenus *S. Caprisalix*) were, with one exception, not selected. It is therefore likely that larvae will develop successfully in all of the commercially utilised tree willows in New Zealand.

Willows in Auckland were seriously defoliated in February 1997, but less so during the 1997-1998 summer. Similarly the 1998-1999 summer has to date showed little sign of defoliation. Larvae have been present on lakeside plantings of willow in Rotorua, but have as yet not adversely or markedly affected willow appearance or vigour. Conversely sawfly numbers in Gisborne have continued to remain high this summer (1998-1999) following on from the outbreak in 1997-1998, and willows are showing signs of heavy defoliation.

Although the New Zealand willow population is not under a death sentence from immediate defoliation, it will however take several years of research from a stable sawfly population base, before reliable predictions of long-term consequences can be made.

## Identification

### Life Cycle

As with all insects, the willow sawfly has several stages of development. They are:

- Egg
- Larva
- Pupa
- Adult

Adult sawflies lay their eggs in willow leaves; emerging larvae feed on the leaves and then form cocoons either on the tree or in the soil under the tree. Inside the cocoon, the sawfly pupates and changes into an adult.

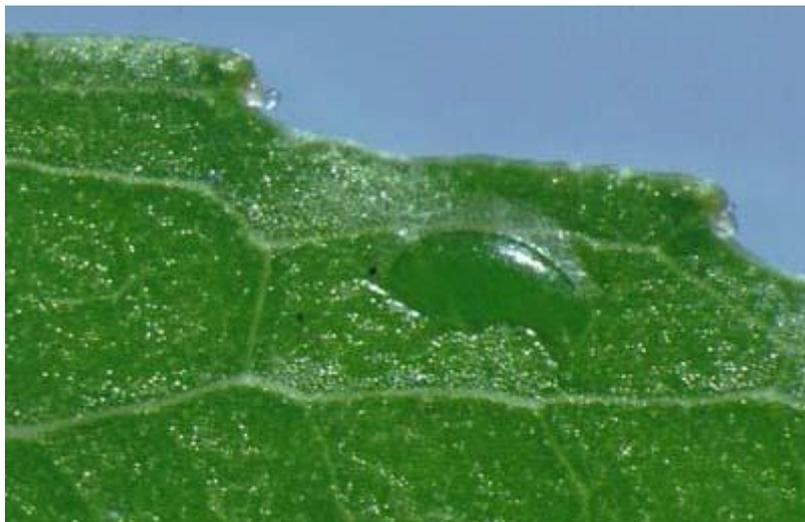
The development time in each stage is dependent on a number of environmental factors, temperature probably being a major factor. Within a growing season sawflies

will therefore be able to complete one or more generations. In New Zealand laboratory tests, adult sawflies lived for about 5 days on average, while overseas research has shown that the eggs developed in around 6 days at 23°C, larvae developed in around 14 days and pupation lasted about 9 days.

Current research in New Zealand will determine the developmental times of the insect in various parts of the country, and hence the number of generations likely to be encountered during a season.

As the sawfly feeds specifically on willows, it survives winter (without food when willows have shed leaves) as a diapausing larvae or pre-pupae inside cocoons. In Auckland, larvae entered diapause during May in both 1997 and 1998. Diapause lasted for about 5 months in 1997, with the first spring record of adults on 20 October 1997. This season (1998-1999), larvae were first observed in Gisborne in early October 1998.

### **Appearance**



**Figure 1** - Egg (typically 1-2 mm long)  
*(Photo courtesy of D. Allan)*



**Figure 2** - Egg and larva (approx. 5 mm long)  
*(Photo courtesy of D. Allan)*



**Figure 3** - Larva (15 - 20 mm when fully grown)  
*(Photo courtesy of D. Allan)*



**Figure 4** - Larva, head detail (note brown stripe and position of jaws)  
*(Photo courtesy of D. Allan)*



**Figure 5** - Larva, feeding pattern  
*(Photo courtesy of D. Allan)*



**Figure 6** - Pupa (approx. 10 mm long)  
*(Photo courtesy of D. Allan)*



**Figure 7 - Adult (approx. 10 mm long)**  
(Photo courtesy of D. Allan)

**Leaf Feeding Pattern and Tree Damage**



**Figure 8 - Typical feeding pattern of larvae**  
(Photo courtesy of C Van Kraayenoord)



**Figure 9 - Damage to shoots, note leaves stripped to the midrib**  
(Photo courtesy of C Van Kraayenoord)



**Figure 10** - Complete defoliation of golden willow (right) in Gisborne, March 1998. Adjacent *Salix matsudana* row plantings (left) are moderately defoliated

## **Further Information**

### **Contacts**

For general information, contact your local Regional Council Land Management or River Engineering officer.

For information on the sawfly contact:

[John Charles](#)

HortResearch

Mt Albert Research Centre

Private Bag 92 169

AUCKLAND

Tel: +64-9-849 3660

Fax: +64-9-815 4201

If you find sawfly samples and wish to have them positively identified please mail (preferably couriered) to John Charles. All samples should be securely sealed, along with fresh leaves, in polythene bags or containers and placed in cushioned envelopes. Film containers with the lids securely taped on are fine, also small screw-top vials available from chemist shops.

When sending sawfly samples please include your name, address, telephone number, date of collection and type of willow, location, habitat (park, garden, stream bank, etc.).

For information on possible impacts on willow plantings contact:

[Lindsay Fung](#)

HortResearch

Palmerston North Research Centre

Private Bag 11 030

PALMERSTON NORTH

Tel: +64-6-356 8080 Ext 7754

Fax: +64-6-354 6731

### **Booklet**

*This guide is also available in print.*

### **Reading**

*The following reports provide detailed information of the sawfly and its arrival in New Zealand, as well as providing references of published scientific research on *N. oligospilus*.*

*Baker, R. T., Bullians, M. S., Richmond, J. E., Cowley J. M. and Whyte, C. F., 1997. **Delimiting survey for sawfly on willow, *Nematus oligospilus* Förster (Hymenoptera: Tenthredinidae)**. NZ Plant Prot. Centre, Lynfield, Auckland, 6 March 1997, 20pp.*

*Cowley, J. M. and Whyte, C. F., 1997. **Impact assessment for sawfly on willow, *Nematus oligospilus* Forster (Hymenoptera: Tenthredinae)**. NZ Plant Prot. Centre, Lynfield, Auckland, 6 March 1997, 21pp.*

*Charles, J. and Froud, K., 1997. **Willow sawfly, *Nematus oligospilus*, in New Zealand. Current status and knowledge**. HortResearch Client Report No. 97/89, Mt Albert Res. Centre, Auckland, August 1997, 10pp.*

*Charles, J. and Allan, D. J., 1998. **Willow sawfly, *Nematus oligospilus*, in New Zealand. Update of current status**. HortResearch Client Report No. 98/134, Mt Albert Res. Centre, Auckland, June 1998, 10pp.*

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