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# THE ENTOMOFAUNA OF CONES OF *LARIX DECIDUA* AND *L. KAEMPFERI* IN THE THE NETHERLANDS

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**Summary**

*Megastigmus pictus* (Förster) (Hymenoptera: Torymidae) and *Eurytoma laricis* Yano (Hymenoptera: Eurytomidae) caused a loss of 52.6% of the filled seeds harvested in 1986 in the larch hybrid seed orchard at Vaals. In 1988, 47.0% of the seeds of *Larix decidua* Mill. in the same seed orchard were externally damaged by insects; seed chalcids destroyed 69.2% of the remaining filled seeds. A preliminary overview is given of the species new to the Dutch fauna which were reared in 1986, 1989 and 1990 from cones of *L.decidua* and of *Larix kaempferi* (Lamb.) Carr. Two new parasitoids, *Dendrocerus chloropidarum* (Ceraphronoidea: Megaspilidae) and *Rhoptromeris strobigena* (Cynipoidea: Eucoilidae) were reared from chloropid puparia present in the cones.

## INTRODUCTION

*Larix eurolepis* Henry is a hybrid of the European larch, *Larix decidua* Mill. and the Japanese larch, *Larix kaempferi* (Lamb.) Carr. The seed is much in demand because of the hybrid's fast growth and its resistance against the fungus *Lachnellula willkommii* (Hartig) Dennis (Gremmen, 1982). For the production of the hybrid seed, a seed orchard of 2 ha containing clones of both species was established in 1969 at Vaals. Cones are collected from the only *L.decidua* clone. Harvests of hybrid seed have been poor (0.2-4.0 kg) except in 1975 (8.3 kg) and 1977 (38.0 kg). Although the larch trees usually produce good cone crops every 2 or 3 years, a great part of the seed is often empty due to insufficient pollinization of the female flowers on the European larch. In addition, cone and seed insects attacking filled seeds contribute to the reduction of the seed crop. Since 1986, insects attacking cones and seed of *L.decidua* and *L.kaempferi* have been collected and analyses were made to estimate the losses that could be attributed to these insects.

## MATERIAL AND METHODS

In 1986, 1989 and 1990, insects attacking cones and seed of *L.decidua* and *L.kaempferi* were reared from cones collected
in the seed orchard at Vaals and in forest stands of these tree species at Wageningen, Bennekom and Grollo. Larvae of Lepidoptera were removed and reared on an artificial diet described by Moraal (1989). Pupae were kept under laboratory conditions until 15 October when they were placed at -2°C until 1 March of the following year. Emerged insects were identified or verified by taxonomists specialized in the families concerned. Two studies were conducted in which seed losses due to insect attack were quantified.

**1. Losses caused by seed chalcids.** In March 1986, losses were determined in 10 lots of 100 randomly selected seeds of the total seed harvest of *L.decidua* at Vaals. In June, after most insects had emerged, the number of seeds that was empty, filled or still inhabited by insects was determined in a cutting test.

**2. Damage caused by cone insects and seed chalcids.** In March 1989, an analysis was made of the losses that could be attributed to all insects damaging seeds of *L.decidua*; 40 cones were selected randomly from 350 cones harvested on 2 March in the same seed orchard. All scales were removed from the cones and the number of seeds that had been damaged externally by insects was counted. In June, after most of the insects had emerged, the number of externally undamaged seeds that was empty, filled or still inhabited by insects was determined in a cutting test.

## RESULTS

**1. Losses caused by seed chalcids.** *Megastigmus pictus* Förster (Torymidae) and *Eurytoma laricis* Yano ( Eurytomidae) were reared from the seeds. The seed chalcids accounted for a loss of 52.6% of the filled seeds in 1986 (Tab. 1).

| Variable | Mean | S.D. | N | Median | Minimum | Maximum |
|---|---|---|---|---|---|---|
| Filled seeds | 10.9 | 1.45 | 10 | 11.0 | 9.0 | 13.0 |
| Empty seeds | 77.0 | 3.06 | 10 | 77.5 | 71.0 | 81.0 |
| Seed chalcids | 12.1 | 2.13 | 10 | 11.5 | 10.0 | 16.0 |
| Seed loss (%) | 52.6 | 0.04 | 10 | 52.5 | 45.5 | 60.0 |

*Table 1. Statistics of seed losses due to chalcids in 1986.*

**2. Damage caused by cone insects and seed chalcids** (Tab. 2). In 1988, 47.0% of all seeds were externally damaged by insects (Table 2). The species responsable for this type of damage are mainly Lepidoptera (*Cydia illutana, Dioryctria abietella*) and Diptera (*Strobilomyiia* spp., *Resseliella*

*skuhravyorum*). Of the seeds that appeared undamaged, the majority (85.1%) was empty, while 69.2% of the filled seeds were attacked by the seed chalcids. Per cone, only 2 filled seeds could have been harvested; consequently, the cone harvest was cancelled. The analysis clearly demonstrated that the seed orchard is affected by two major problems, one concerning pollination and the other concerning insects.

| Variable | Mean | S.D. | N | Median | Minimum | Maximum |
|---|---|---|---|---|---|---|
| Seeds ext. damaged | 40.6 | 21.6 | 40 | 43.0 | 0.0 | 80.0 |
| Seeds not ext. damaged | 45.7 | 18.8 | 40 | 43.5 | 10.0 | 82.0 |
| Total number of seeds | 86.4 | 9.8 | 40 | 87.5 | 63.0 | 112.0 |
| Empty seeds | 38.9 | 15.8 | 40 | 35.0 | 10.0 | 77.0 |
| Filled seeds | 2.0 | 3.3 | 40 | 1.0 | 0.0 | 17.0 |
| Seeds with chalcids | 4.6 | 4.4 | 40 | 3.5 | 0.0 | 23.0 |

*Table 2. Statistics of seed losses per cone due to cone insects and seed chalcids in 1988.*

A preliminary list of the insect species that were reared from the cones and which are new (*) or most probably new (**) to the Dutch fauna is given below. Unless otherwise indicated, the number of specimens exceeded 10 ♂♂ and 10 ♀♀.

**Lepidoptera**
Species: **Cydia illutana* H.-S. (Tortricidae)
Identification: P.Grijpma, K.J Huisman, J.C.Koster
Coll.: June, July 1989. Em.: May 1990 (lab) 7♂♂,5♀♀.
Locality: Vaals, Wageningen, Grollo
Host: *L.decidua, L.kaempferi*
Comments: Hibernates in the larval stage. Reared on diet from 3d instar larvae to adult.
References: Danilevski & Kuznetsov, 1968;

**Diptera**
Species: ***Strobilomyiia melania* Ackl. (Anthomyiidae)
Identification: A.Roques
Coll.: June 1989. Em.: March 1990 (lab) 2♂♂,9♀♀.
Host: *L.decidua, L.kaempferi*
Localities: Vaals, Grollo
References: Roques & al. 1983, 1984

Species: ***Strobilomyiia infrequens* Ackl. (Anthomyiidae)
Identification: A.Roques
Coll. June 1989. Em.: March 1990 (lab) 3♂♂,2♀♀
Host: *L.kaempferi*
Localities: Grollo
References: Roques & al., 1984; Roques & v. Hirscheydt, 1990

Species: **Resseliella skuhravyorum* Skrz. (Cecidomyiidae)
Identification: M.Skrzypczynska, W.Nijveldt
Coll.: July 1989. Em.: April 1990 (lab)
Host: *L.decidua*
Locality: Vaals

References: Skrzypczynska, 1975a

Species: *Hapleginella* sp.; *Gaurax* sp. (Chloropidae)
Identification: H. Andersson
Coll.: Jan. 1989. Em. May 1989.
Host: *L.decidua*
Locality: Vaals
References: Roques, 1983; Gaidene & Nartshuk, 1963

**Hymenoptera**
Species: **Dendrocerus chloropidarum* (Megaspilidae)
Identification: P. Dessart
Coll.: March 1989. Em. March and May 1989 (lab). 2♂♂.
Host: *Hapleginella* sp. and/or *Gaurax* sp. (Chloropidae)
Locality: Bennekom, Vaals
Reference: Dessart, 1990

Species: **Rhoptromeris strobigena* (Eucoilidae)
Identification: G. Nordlander
Coll.: Jan.-March 1889. Em. Feb.-May 1989.
Host: *Hapleginella* sp. and *Gaurax* sp. (Chloropidae)
Locality: Vaals, Wageningen, Grollo
Reference: Nordlander & Grijpma, 1991

Species: **Megastigmus pictus* (Förster) (Torymidae)
Identification: W.J. Gijswijt
Coll.: March 1986, 1989. Em.: April 1986, May 1989 (lab)
Host: *L.decidua, L.kaempferi*
Locality: Vaals, Wageningen, Grollo
Comments: Lanz (1942) already presumed that this chalcid attacked seeds of *L.decidua* since 1927 in The Netherlands.
References: Roques, 1983; Schwenke, 1982

Species: **Eurytoma laricis* Yano (Eurytomidae)
Identification: Z. Bouček
Coll.: March 1986, 1989. Em. April 1986, May 1989 (lab)
Locality: Vaals, Wageningen, Grollo
Host: *L.decidua, L.kaempferi*
Comments: *Eurytoma boučeki* Skrz. from seed of *L.polonica* and *L.decidua*, is possibly a synonym of *E.laricis* (Z.Bouček).
References: Schwenke, 1982; Skrzypczynska, 1975b, 1975c,

Species: **Phaenocarpa seitneri* Fahringer (Braconidae)
Identification: C. van Achterberg
Coll.: June 1989. Em.: April 1990 (lab) 1♂
Hosts: *Strobilomyia* spp. (Dipt., Anthomyiidae).
Locality: Grollo
Comments: *S.infrequens* Ackl. and *S.melania* Ackl. were also reared from the cones of *L.kaempferi*.
References: Seitner, 1929; Van Achterberg & Roques, 1987

Species: ***Aphanogmus strobilorum* Bakke (Calliceratidae)
Identification: P. Dessart
Coll.: August 1989. Em. October 1989 (lab) 3♂♂,3♀♀.
Host: *Asynapta strobi* (Kieffer) (Dipt., Cecidomyiidae)

Locality: Vaals
Comments: Bakke (1955) reared this parasitoid from *A.strobi* present in *Picea abies* cones.
References: Skrzypczynski, 1977; Nijveldt, 1981

Species: **Anogmus laricis* Bouček (Pteromalidae)
Identification: Y.Jongema
Coll.: March 1989. Em. May 1989 (lab)
Host: presumably *Asynapta strobi*
Locality: Vaals
References: Kristek & al., 1976; Skrzypczynska, 1978

Species: **Eupelmus pullus* Ruschka (Eupelmidae)
Identification: Z. Bouček
Coll.: March 1986, Aug.1989 Em. May 1986, April 1990 (lab).
Host: *Resseliella skuhravyorum* Skrz. (Dipt., Cecidomyiidae)
Locality: Vaals
References: Skrzypczynska, 1978

Species: **Pediobius deplanatus* Bouček (Eulophidae)
Identification: Y.Jongema
Coll.: March 1989. Em. May 1989 (lab).
Host: presumably *Hapleginella* sp. and/or *Gaurax* sp. (Dipt., Chloropidae)
Locality: Vaals
Comments: Reared from chloropid puparia in *L.decidua* cones

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