

Sesia apiformis (Lepidoptera: Sesiidae) living in *Populus* root suckers

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Abstract. Larvae, pupae and feeding signs of *Sesia apiformis* (Clerck, 1759), hornet moth, are mostly found under the bark at the base of trunks and in nearby roots of different species of *Populus*. Less often, they complete their development inside thin roots and root suckers of suitable host trees. Some of these observations are described, illustrated and compared to a few other insect larvae that can be found in *Populus* root suckers.

Samenvatting. Rupsen, poppen en vraatsporen van *Sesia apiformis* (Clerck, 1759), hoornaarvlinder, worden doorgaans waargenomen aan de basis van forse stammen en in aangrenzende wortels van diverse populierensoorten. Minder vaak vervolledigen ze hun levenscyclus ook in zeer jonge exemplaren van de waardplanten en in scheuten die ontstaan uit worteluitlopers. In dit artikel worden dergelijke vondsten beschreven, geïllustreerd en vergeleken met enkele andere insectenlarven die zich hierin kunnen ontwikkelen.

Résumé. Les chenilles, chrysalides et indices de présence de *Sesia apiformis* (Clerck, 1759), la Sésie apiforme, sont habituellement observés à la base des gros troncs et dans les racines adjacentes de diverses espèces de peupliers. Moins souvent, elle réalise avec succès son cycle de vie dans de très jeunes plants de ses plantes hôtes et dans des pousses issues de drageons. Dans cet article, de telles découvertes sont décrites, illustrées et comparées à d'autres larves d'insectes qui peuvent s'y développer.

Key words: *Sesia apiformis* — Sesiidae — Bionomics — *Populus* — *Paranthrene tabaniformis* — *Lamia textor*.

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Introduction

Sesia apiformis (Clerck, 1759) is the largest and one of the most widespread clearwing species in Europe (Laštůvka & Laštůvka 2001). It was also introduced in North America (pers. comm. D. Bartsch). Although many clearwing species are rarely seen as an adult, this is not the case for *S. apiformis*: adult moths are relatively often observed in the field.

Nevertheless, the easiest way to confirm its presence is by searching for old exit holes at the base of mature poplar (*Populus* spp.) tree trunks, which seem to be preferred by this species (Fig. 1). A few observations over the years however reveal that not only old tree trunks are used.



Fig. 1. *Sesia apiformis* ♂, ex larva, 09.i.2019, Lebbeke (OV), larva at base of *Populus x canadensis* tree trunk, 27.v.2019. © Ruben Meert.

Fig. 1. *Sesia apiformis* ♂, ex larva, 09.i.2019, Lebbeke (OV), rups in stambasis van *Populus x canadensis*, 27.v.2019. © Ruben Meert.

Bionomics

Adult females lay their eggs in June and July. Although it is sometimes observed that the egg is glued on substrates, most eggs seem to be scattered around on the ground while the adult is sitting on the trunk of a suitable host tree or in the nearby vegetation (Schweizerischer Bund Für Naturschutz 2000, Newland & Sawyer 2014).

The sap feeding larva lives in galleries beneath the bark of the host tree, mostly at the base of the trunk and thick roots near the surface of the soil. The development takes 3 or 4 years, the larva overwintering 2 or 3 times.

In the autumn before the last hibernation most larvae create a future exit hole, only leaving a thin slice of bark to cover it, and start constructing a firm cocoon in which overwintering takes place. Cocoons are mostly found at the base of the trunk, often lower than 0,5 m above the ground, but sometimes considerably higher (on 17 March 2017 an empty cocoon was located between 4 and 5 m high in an old *Populus nigra* 'Italica' tree, pers. obs.). Before emerging early in the morning, the pupa pushes away the remaining piece of bark (Fig. 1).

Larvae, pupae, exuviae and exit holes have been found on different kinds of poplar like *P. alba*, *P. nigra*, *P. nigra* 'Italica', *P. x canadensis*, *P. balsamifera*, *P. tremula*, *P. alba* (Ebert 1997), *P. trichocarpa* and *P. x canescens* (pers. Obs.). Occasionally some *Salix* spp. are used: *S. alba*, *S. elaeagnos* (Schweizerischer Bund Für Naturschutz 2000), *S. caprea* (Goossens 2020) and *S. acutifolia* (pers. obs. 2022).

In case of *Salix alba*, *S. caprea* and *S. elaeagnos* ssp. *angustifolia*, a narrow leaved subspecies (Meert 2021), larvae and feeding signs should be checked as those trees are used as a host plant by the closely related *Sesia bembeciformis* (Ebert 1997, waarnemingen.be 2021, pers. obs.). An easy way to distinguish both *Sesia* species is by looking at the position of the cocoon and larva or pupa within the gallery. In case of *S. apiformis* the cocoon is

made just below the exit hole, with larva and pupa positioned head upwards. The cocoon of *S. bembeciformis* is made at the end of a gallery above the exit hole, with larva and pupa head downwards.

Big trees are preferred by *S. apiformis*: at the base of old poplar trunks exit holes can easily be found, as they remain visible for many years (Fig. 2).



Fig. 2. *Sesia apiformis*, old exit holes at base of *Populus alba* tree trunk, 11.iii.2016, Brussels (VB). © Ruben Meert.

Fig. 2. *Sesia apiformis*, oude uitsluitgaten in stambasis van *Populus alba*, 11.iii.2016, Brussel (VB). © Ruben Meert.



Fig. 3. *Sesia apiformis*, empty cocoon at base of 3-year-old *Populus trichocarpa* cutting, 17.ii.2018, Lebbeke (OV). © Ruben Meert.

Fig. 3. *Sesia apiformis*, lege cocon onderaan een 3 jaar oude gestekte plant van *Populus trichocarpa*, 17.ii.2018, Lebbeke (OV). © Ruben Meert.

Observations on young trees and shoots

In February 2018 the author noticed an empty, last year's cocoon of *S. apiformis* at the base of a 3-year-old *P. trichocarpa* cutting that was clearly languishing (Fig. 3). As it was cut and planted in winter 2015–2016, the observation confirms that this species can complete its development after only 2 hibernations.



Fig. 4. *Populus alba* (possibly 'Bolleana') with root suckers, 17.vii.2020, Crots (Hautes-Alpes), France. © Ruben Meert.

Fig. 4. *Populus alba* (mogelijks 'Bolleana') met wortelopslag, 17.vii.2020, Crots (Hautes-Alpes), Frankrijk. © Ruben Meert.

In July 2020 the author discovered several large columnar *Populus alba* trees (possibly *P. alba* 'Bolleana') in Crots (Hautes-Alpes, France) (Fig. 4), with a lot of young and small root suckers (adventitious shoot formation by roots). These shoots sprouted on horizontal roots just beneath the surface of the soil. Some of these shoots were clearly in bad condition or even completely dried out (Fig. 5). When pulling them out of the ground, they easily broke off. A closer look at the remaining parts of the root and the base of the shoots revealed several feeding signs (brown frass) (Fig. 6), larvae (Figs 7, 8) and empty cocoons of *Sesia apiformis*. Some roots were almost entirely destroyed by the larval feeding, causing serious damage to the shoots. Some larvae however were found in healthy looking suckers. In all, 10 larvae were observed, showing different stages of development.

Remarkably, while the young roots and shoots were well infested by *S. apiformis* larvae, no exit holes could be found at the base of the big trunks of the adult trees (50 cm diameter and more) that produced the root suckers.



Fig. 5. Infested and wilted *Populus alba* (possibly 'Bolleana') root sucker, 17.vii.2020, Crots (Hautes-Alpes), France. © Ruben Meert.

Fig. 5. Geïnfesteerde en verwelkte wortelscheut van *Populus alba* (mogelijks 'Bolleana'), 17.vii.2020, Crots (Hautes-Alpes), Frankrijk. © Ruben Meert.



Fig. 6. *Sesia apiformis*, larval feeding signs in root of *Populus alba* root sucker, 17.vii.2020, Crots (Hautes-Alpes), France. © Ruben Meert.

Fig. 6. *Sesia apiformis*, vraatsporen in wortel van *Populus alba* wortelopslag, 17.vii.2020, Crots (Hautes-Alpes), Frankrijk. © Ruben Meert.

Some infested root suckers were collected and potted. One larva created some kind of large cavity at the base of the shoot at soil level, in which on 7 January 2021 the top of a cocoon could be observed (Fig. 9). The adult emerged on 14 June 2021 (Fig. 10).

Daniel Bartsch confirms that most larval finds come from middle sized and large trees, but also young trees and root suckers come into consideration. He found numerous larvae in root suckers of *Populus nigra* near

Grißheim (Baden-Württemberg, Germany). Rolf Bläsius found a larva in a young shoot of *P. alba* of only 2 cm in diameter. Larvae were also frequently found in the roots of young *Populus tremula* trees by Bläsius and Bartsch (pers. comm. Daniel Bartsch).

Several search efforts in Belgium revealed that not in every case root suckers are used by *S. apiformis* to feed in. Possibly the density of the surrounding vegetation is a key factor: the infected *P. alba* root suckers in Crots (France) were growing amongst thin grasses that did not cover all of the soil (Fig. 4). These conditions allow the soil to warm up easier. Until now, no infected root suckers were reported growing in very dense vegetation.



Fig. 7. *Sesia apiformis*, half grown larva in root of *Populus alba* root sucker, 17.vii.2020, Crots (Hautes-Alpes), France. © Ruben Meert.

Fig. 7. *Sesia apiformis*, halfvolgroeide rups in wortel van *Populus alba* wortelopslag, 17.vii.2020, Crots (Hautes-Alpes), Frankrijk. © Ruben Meert.

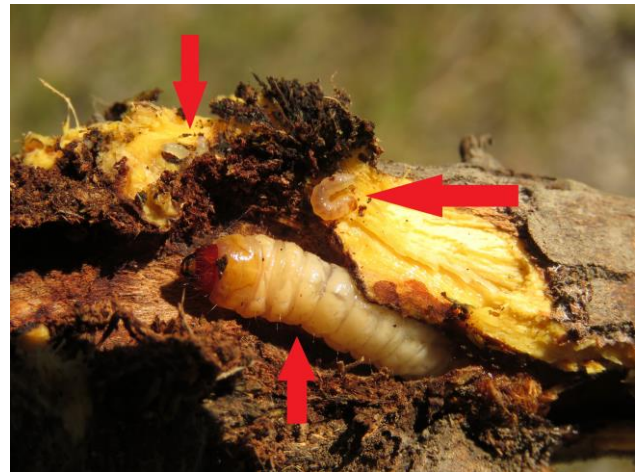


Fig. 8. *Sesia apiformis*, 3 larvae in different stages of development in root of *Populus alba* root sucker, 17.vii.2020, Crots (Hautes-Alpes), France. © Ruben Meert.

Fig. 8. *Sesia apiformis*, 3 rupsen in verschillende ontwikkelingsstadia in wortel van *Populus alba* wortelopslag, 17.vii.2020, Crots (Hautes-Alpes), Frankrijk. © Ruben Meert.



Fig. 9. *Sesia apiformis*, cocoon in stem of thin root sucker of *Populus alba*, 07.i.2021, larva found in Crots (Hautes-Alpes), France, 17.vii.2020. © Ruben Meert.

Fig. 9. *Sesia apiformis*, cocon in stammetje van dunne wortelscheut van *Populus alba*, 07.i.2021, rups gevonden in Crots (Hautes-Alpes), Frankrijk, 17.vii.2020. © Ruben Meert.



Fig. 11. *Lamia textor*, larva, causing wilting of a *P. nigra* root sucker, Latour-de-France (Pyrénées-Orientales), France, 23.v.2021. © Ruben Meert.

Fig. 11. *Lamia textor*, larve, verwelking van wortelscheut van *P. nigra* door vraat, Latour-de-France (Pyrénées-Orientales), Frankrijk, 23.v.2021. © Ruben Meert.



Fig. 10. *Sesia apiformis* ♂, emerged imago and exuvium, 14.vi.2021, larva found in Crots (Hautes-Alpes), France, 17.vii.2020. © Ruben Meert.

Fig. 10. *Sesia apiformis* ♂, uitgeslopen imago en exuvium, 14.vi.2021, rups gevonden in Crots (Hautes-Alpes), Frankrijk, 17.vii.2020. © Ruben Meert.



Fig. 12. *Lamia textor*, larva, in root of root sucker of *P. nigra*, Latour-de-France (Pyrénées-Orientales), France, 23.v.2021. © Ruben Meert.

Fig. 12 *Lamia textor*, larve, in wortel van wortelscheut van *P. nigra*, Latour-de-France (Pyrénées-Orientales), Frankrijk, 23.v.2021. © Ruben Meert.

Other insects in thin *Populus* roots

On 23 May 2021 similar feeding signs as those of *S. apiformis* could be found in root suckers of *Populus nigra* in Latour-de-France (Pyrénées-Orientales, France), showing poor vitality of the shoot (Fig. 11). In this case a nearly full grown larva of *Lamia textor* (Linnaeus, 1758) (Cerambycidae) caused the distorted growth (Fig. 12, 13).



Fig. 13. *Lamia textor*, emerged imago and exit hole, 12.viii.2021, larva found in root of root sucker of *P. nigra*, Latour-de-France (Pyrénées-Orientales), France. © Ruben Meert.

Fig. 13. *Lamia textor*, imago en uitkruipgat, 12.viii.2021, larve gevonden in wortel van wortelscheut van *P. nigra*, Latour-de-France (Pyrénées-Orientales), Frankrijk. © Ruben Meert.



Fig. 14. *Paranthrene tabaniformis*, future and old exit hole in thin root of *Populus nigra*, Fabrègues (Hérault), France, 22.v.2021. © Ruben Meert.

Fig. 14. *Paranthrene tabaniformis*, toekomstig en oud uitsluitgat in dunne wortel van *Populus nigra*, Fabrègues (Hérault), Frankrijk, 22.v.2021. © Ruben Meert.

Longhorn beetle larvae in general have no or poorly developed legs and the prothorax is often enlarged, which makes it easy to distinguish them from Sesiidae larvae.

Finally, on 22 May some pupae of *Paranthrene tabaniformis* (Rottemburg, 1775) were discovered in Fabrègues (Hérault, France) in a 4 cm thick root of *P. nigra*. This root belonged to a recently cut tree (so not really a sucker) and was partially exposed to the ground surface. The future exit holes were closed with a thin layer of silk in which a bit of frass and sand were incorporated (Fig. 14). The pupae were situated approximately 20 cm from the remaining tree stump (Fig. 15), in which several other pupae and exuviae were found. *P. tabaniformis* taking roots to complete its development, is considered to be rather exceptional.

Conclusions

Although old or big poplar tree trunks are without doubt the primary feeding habitat for *Sesia apiformis* larvae, in optimal conditions young trees and root suckers are also used. Sometimes the larva causes wilting of the shoot, in a way many Sesiidae species feeding in roots of herbaceous plants do. Some longhorn beetle larvae can occur in similar conditions.

Larvae and pupae in infected root suckers or cuttings are quite easy to collect, whereas specimens at the base of big trunks have to be chopped out of the bark or wood.

No larvae of *S. apiformis* could be found in young *Populus* saplings. Compared to suckers, the roots of saplings are probably too thin for a larva to live in. Even when the shoot above ground dies, the sap flow in root suckers of big trees is also still guaranteed, which is not always the case with saplings.



Fig. 15. *Paranthrene tabaniformis*, pupa in thin root of *P. nigra*, Fabrègues (Hérault), France, 22.v.2021. © Ruben Meert.

Fig. 15. *Paranthrene tabaniformis*, pop in dunne wortel van *P. nigra*, Fabrègues (Hérault), Frankrijk, 22.v.2021. © Ruben Meert.

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