

# Vanhornia leileri, a new species and new family for the Netherlands (Hymenoptera: Vahnorniidae)

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## KEYWORDS

Eucnemidae, dead wood, Proctotrupeoidea, skylight

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On the 26th of June 2019, in Wageningen (Province of Gelderland) two female specimens of *Vanhornia leileri* were collected from two skylights, situated in the roof of a covered walkway between a house and a shed. *Vanhornia leileri* is the only European representative of the Vahnorniidae, a family that has not been previously reported from the Netherlands. *Vanhornia leileri* is a very rare parasitoid wasp of false click beetles (Eucnemidae).

## Introduction

In the period May-July 2019, the first author collected and photographed a large number of crabronid wasps (Crabronidae) from skylights behind a house in Wageningen (province of Gelderland). The second author found among these collected wasps two specimens of an unknown species, that the third author recognized as *Vanhornia leileri* Hedqvist (figure 1). The family Vahnorniidae, to which this species belongs, has not been reported from the Netherlands up till now. This article discusses the collecting method, taxonomy, distribution and biology of this new and very interesting species.

## Skylights

Two *V. leileri* specimens were collected from two skylights situated in the roof of a covered walkway between a house and a shed (figure 2). The skylights (surface area approx. 1 m<sup>2</sup> and depth approx. 50 cm) have a similar effect on flying insects as emergent traps. During the day, large numbers of flying insects gather in the transparent domes of the skylights. They sit or fly around in the concave underside of the domes where they can easily be collected.

Over the past five years a number of fly (Diptera) and cicada species (Cicadellidae) that were collected from these skylights have been reported new to the Dutch fauna (Belgers 2019, Beuk & Belgers 2017, De Bree *et al.* 2019, Den Bieman 2017, Den Bieman & Van Klink 2015). In the vicinity of the skylights are gardens with a few large maple and birch trees and a road with on both sides a large number of old oak trees.

## Taxonomy and distribution

Crawford (1909) described the new genus *Vanhornia* for which he created the new family Vahnorniidae. Vahnorniidae is one of the smaller families that belong to the superfamily Proctotrupeoidea. In the Netherlands, the Proctotrupidae ('priemwespen') and Heloridae ('gaasvliegvespen') are also known from this superfamily. According to Townes & Townes (1981) Vahnorniidae is a

subfamily of Proctotrupidae with two genera: *Heloriserphus* and *Vanhornia*. The genus *Heloriserphus* contains two species from Chile (Townes & Townes 1981). Masner (in Townes & Townes 1981) does not agree with the classification of Townes & Townes (1981), but considers *Heloriserphus* as a distinct subfamily that should be placed at the base of the family Proctotrupidae. Here we follow Masner's vision.

Within the genus *Vanhornia*, three species have been described: *V. eucnemidarum* Crawford, *V. guizhouensis* (He & Chu) and *V. leileri*. *Vanhornia eucnemidarum* lives mainly in eastern North America, from Quebec to Florida, but has recently also been reported from the western part of North America (Manitoba) and from South Korea (Choi & Lee 2012, Deyrup 1985, Hogan *et al.* 2019, Kleiner *et al.* 2019). *Vanhornia guizhouensis* is found in China and Thailand (Artmann-Graf 2016, He & Chu 1990). *Vanhornia leileri* is a Palaearctic species that was first described by Hedqvist in 1976 and is known from Sweden, Switzerland, Germany, Eastern Russia and now also from the Netherlands (Artmann-Graf 2016, Doczkal 2017, He & Xu 2015, Hedqvist 1976). An identification table for the three species of the genus *Vanhornia* is given in He & Xu (2015).

We propose the name 'dwarskaakwespen' as the Dutch name for the family Vahnorniidae and 'Europese dwarskaakwesp' for the species *Vanhornia leileri*, based on the distinctive mandibles (see description below).

**Material** Province of Gelderland: Wageningen (51.966°N 5.674°E), two females collected from skylight, 26.vi.2019, leg. D. Belgers, det. Th. Peeters, 1 ♀ col. Natuurmuseum Brabant, Tilburg & 1 ♀ col. Naturalis Biodiversity Center, Leiden.

## Description

The following description is largely taken from Hedqvist (1976). Female length 4 mm, thereby the two females collected in the Netherlands are slightly smaller than the 4.5 mm sized female described in Hedqvist (1976) (figure 3a). Colour black, legs and tegulae yellowish brown and antenna brown. Wing veins black (figure 3b). The entire body with short white setae. Head with



1. Habitus female *Vanhornia leileri* (4 mm), (a) dorsal side and (b) lateral side. Wageningen (province of Gelderland), 26.vi.2019. Photos: Dick Belgers

1. Habitus vrouwtje *Vanhornia leileri* (4 mm), (a) dorsale zijde en (b) laterale zijde. Wageningen (Gelderland), 26.vi.2019.

scattered punctuation (figure 3c-d). Mandibles with 5 teeth (figure 3c-d). Antennae 13-jointed, inserted near the base of clypeus. Clypeus with anterior margin shallowly emarginate. Occiput with a carina. Notauli strong with large pits. Scutellar fovea deep with carinae, scutellum smooth. Propodeum rugose with tooth-like processes. Petiole short, transverse. Gaster with the tergites fused into a carapace, basally truncate with a transverse carina from which arise longitudinal carinae of which the most striking is the mid keel (figure 3f). The carinae reach 2/3 of the carapace, areas between the carinae punctate. Ovipositor longer than gaster (figure 3e-f). Legs with no visible second trochanter, hind tibia with one spur.

A special feature of *Vanhornia* are the exodont mandibles, opening outwards and not overlapping (figure 3c-d). Exodont mandibles are rare in insects, occurring only in *Vanhornia*, in braconids of the subfamily Alysiniinae, and in some larval Eucnemidae (Deyrup 1985, Griffiths 1964, Muona 2010). The adaptive significance of the exodont mandibles of *Vanhornia* is unknown (Deyrup 1985). They are probably a kind of tool that is used during the emerging of the adult from the pupal chamber of the host. This is also the case with other species with exodontal mandibles such as species of the subfamily Alysiniinae (family

Braconidae) (Griffiths 1964). Van Horn (1909) (in Deyrup 1985) described the action of the mandibles from a *Melasis pectinicornis* (Eucnemidae) larvae as saw-like, suitable for the slit-like galleries that the larvae construct in dead wood. Adult eucnemids which, like *Vanhornia*, need only to escape from the pupal chamber, have normal mandibles (Deyrup 1985).

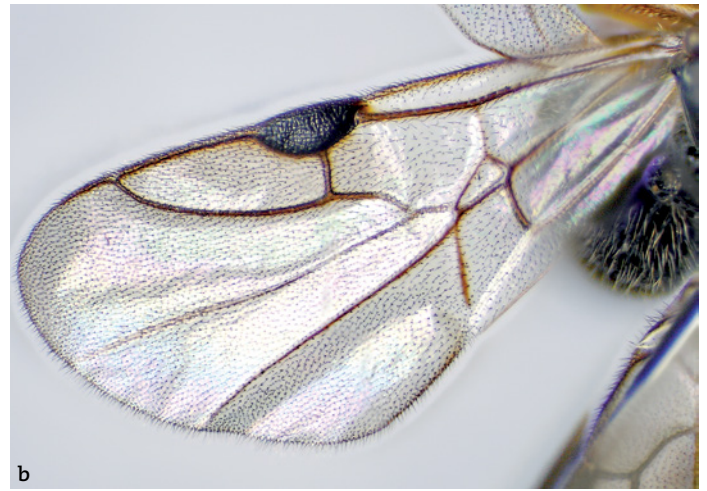
Another interesting aspect is the ovipositor of *Vanhornia*. Deyrup (1985) reports that when it is not in use, it is bent forward at the base so as to lie in a groove along the ventral side of the gaster. This groove is not nearly long enough to hold the ovipositor, which is about the same length as the entire insect (figure 3f). The ovipositor of *V. eucnemidarum* is 5.8 mm long and unusually thin, about 0.05 mm (Deyrup 1985). For the collected Dutch female specimens, the externally visible ovipositor is 2.5 mm long, measured from the tip of the abdomen. The tip of the ovipositor is highly flexible, and its delicate probing resembles that of the tip of a moth's proboscis seeking nectar (Deyrup 1985). The functional morphology of the ovipositor is unknown, but it is probably not used in the same way as the long, wood-drilling ovipositor of certain Ichneumonidae and Braconidae (Deyrup 1985).



2. Skylights over an outside terrace where *Vanhornia leileri* was collected. Photo: Dick Belgers

2. Lichtkoepels boven een buitenterras waar de *Vanhornia leileri* exemplaren zijn aangetroffen.





3. *Vanhornia leileri*, female (same specimen as in figure 1): (a) habitus dorsal side, (b) fore wing, (c) head frontal side, (d) head dorsal side, (e) habitus ventral side, and (f) abdomen lateral side. Photos: Wim Klein

3. *Vanhornia leileri*, vrouw (zelfde individu als in figuur 1): (a) habitus dorsaal, (b) voorvleugel, (c) kop frontaal, (d) kop dorsaal, (e) habitus ventraal, en (f) achterlijf lateraal.

## Biology

Hedqvist (1976) has reared both *V. leileri* specimens (one female and one male) from the false click beetle *Hylis cariniceps* (Reitter) (Eucnemidae). The Nearctic species, *V. eucnemidarum* also uses beetles from the Eucnemidae family as a host: *Isorhipis ruficornis* (Say) (Deyrup 1985). There are eight Eucnemidae species in the Netherlands (Cuppen 2010, Heijerman & Thomas 2016). These belong to five genera: *Melasis buprestoides* (Linnaeus), *Hylis* with three species, *Microrhagus* with two species, *Eucnemis capucina* Ahrens and *Dromaeolus barnabita* (Villa & Villa). All species are rare, except *Melasis buprestoides* which can be regarded as fairly

common. It is interesting to note that on 10th of June 2019, two weeks before the *V. leileri* specimens collection, a female *Microrhagus lepidus* Rosenhauer, was collected from the same skylights (leg. D Belgers, det. & col. J Burgers) (figure 4). *Hylis cariniceps* has not been found in the Netherlands since 1966 and was previously only observed in the province of Limburg (Cuppen 2010). The larvae of most Eucnemidae species develop in decayed wood from deciduous trees and sometimes from coniferous trees (Moraal *et al.* 2003). The development is usually two-year, but sometimes adults of the same population emerge after three to four years. Larvae usually move remarkably slowly





4. Female *Microrhagus lepidus*, habitus dorsal side. Wageningen (province of Gelderland), 10.vi.2019. Photo: Dick Belgers  
4. Vrouw *Microrhagus lepidus*, habitus dorsaal. Wageningen (Gelderland), 10.vi.2019.

and live in soft and moist wood layers under a harder outer layer (Moraal et al. 2003). They probably do not feed on wood but on wood fungi (Leiler 1976, Muona & Teräväinen 2008). Townes & Townes (1981) reported an observation of the ovipositor of *V. eucnemidarum* being passed along a crack in a hardwood log. Deyrup (1985) notes that the structure of the ovipositor of *Vanhornia* suggest that the host is attacked when it is an egg or as a young larva that has not tunnelled far into the wood. There is very little information about the life history of *V. leileri*. So far only adult specimens of this species have been found. Deyrup (1985) found two specimens of *V. eucnemidarum*, one male and one female, which emerged from pupal cells of *Isorhipis rujicornis* in a dead maple tree. The complete larval skin of the host was found in the cells from which the parasitoid emerged. There was no cocoon or visible lining in the cell. The position of the *V. eucnemidarum* pupa with respect to that of the dead host larva was unclear.

The flight activity of adult *V. eucnemidarum* in North America is from mid-May to the end of July (Smith 1995). Hedqvist (1976) found the Swedish *V. leileri* specimens on July 25 and the Swiss sighting was on August 5 (Artmann-Graf 2016). The two German specimens were collected between June 20 and the 6th of July (Doczkal 2017). The Dutch observation was made on June the 26th. The flight activity of *V. eucnemidarum* in North America is therefore broadly in line with the flight activity of *V. leileri* in Europe, with the note that the North American species data consists of 281 specimens (Hogan et al. 2019) and the European species only of seven specimens.

## Discussion

With five European records and only seven collected specimens, we can assume that *V. leileri* is a rare species. It seems very unlikely that this interesting wasp has reached the Netherlands through an area expansion caused by climate-change. The scarcity of specimens is probably due to the rarity of the species. If the host is attacked only as an egg or newly hatched larva, the shortness of opportunity provided for *V. leileri*, combined with a hidden and possibly rare host, might explain the rarity of this species. So far little is known about the host use and the number of host species of *V. leileri*. Eucnemidae larvae are not easily found by entomologists. However if we want to gain more knowledge about the life history of this very interesting parasitoid wasp it is important to find and study larval/pupal cells of false click beetles in dead wood. Through improved forest management, with increased presence of lots of dead and decaying wood, it is expected that the biodiversity of forests will increase significantly. *Vanhornia leileri* should be able to benefit from these measures because it is directly dependent on false click beetle larvae, which only live in dead wood.

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## Samenvatting

### ***Vanhornia leileri*, een nieuwe soort en nieuwe familie voor Nederland (Hymenoptera: Vahnorniidae)**

Uit twee lichtkoepels, gesitueerd in een overkapping tussen een huis en een schuur in Wageningen, werden op 26 juni 2019 twee vrouwtjes van *Vanhornia leileri* verzameld. *Vanhornia leileri* is de enige Europese vertegenwoordiger van de Vahnorniidae, een familie die niet eerder uit Nederland werd gemeld. Vanwege de opmerkelijke kaken die naar buiten staan wordt de naam 'dwarskaakwesp' voorgesteld voor de familie Vahnorniidae en Europese dwarskaakwesp voor de nieuw ontdekte soort. *Vanhornia leileri* is een parasitoïde wesp van schijnkniporren (Eucnemidae) en is nu bekend uit vijf Europese landen. In het verspreidingsgebied zijn in totaal maar zeven individuen verzameld waardoor de soort als zeer zeldzaam wordt beschouwd. Een interessant aspect is de uiterst lange en dunne legboor van *V. leileri*. Wanneer de legboor niet in gebruik is, wordt deze in een groef langs de buikzijde van het achterlichaam gehouden. Over de levensgeschiedenis van *V. leileri* is weinig bekend. Wel is bekend dat ze rechtstreeks afhankelijk is van schijnkniporren waarvan de larven in dood hout leven. Door verbeterd bosbeheer, met een verhoogde aanwezigheid van dood en rottend hout, wordt verwacht dat de biodiversiteit van bossen aanzienlijk zal toenemen. *Vanhornia leileri* zou van deze maatregelen moeten kunnen profiteren.



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