REPRODUCTION OF THE CUCKOO WASP *CHRYSIS TERMINATA* IN NESTS OF *ANCISTROCERUS NIGRICORNIS* (HYMENOPTERA: CHRYSIDIDAE, EUMENIDAE)

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In the period 2012-2017 observations have been done on the cuckoo wasp *Chrysis terminata* parasitizing nests of the potter wasp *Ancistrocerus nigricornis*. The way of placing the egg in the nest, hatching of the egg and development of the larva to imago are documented.

INTRODUCTION

In 1953 J.P. van Lith studied nests of *Ancistrocerus nigricornis* (Curtis, 1826) parasitized by a cuckoo wasp of the '*ignita* group' (Van Lith 1954). The new generation cuckoo wasps from these nests hatched about six weeks later and were sent to W. Linsenmaier for identification. Linsenmaier named them *Chrysis ignita ignita*. After that he changed this name to *Chrysis ignita* form A (Linsenmaier 1959, 1997). Later it was established that the name *C. terminata* Dahlbom, 1854 was available for this taxon (Soon et al. 2014, Paukkunen et al. 2014). In this paper we present observations done on the reproduction behaviour of *C. terminata* in the period 2012-2017, using artificial observation nests in Epe.

OBSERVATIONS

It was found that *A. nigricornis* and the parasite *C. terminata* have the same life cycle. They reproduce early in the year, from the beginning of April until the start of June, the new generation hatches at the end of spring and early summer and the fertilized females of both species hibernate as imago (fig. 1, 2).

On sunny days in spring, females of *C. terminata* were observed searching for nesting sites of *A. nigricornis*. When a nest was found, the cuckoo wasp observed the nest entrance from some distance to see if new preys were being brought in. Sometimes she went into the nest to check the contents. This could take more than two or three hours. The cuckoo wasp layed her egg when she

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Figure 1. Two hibernating females of *Ancistrocerus nigricornis* (november 2014). All photos René Veenendaal.
Figuur 1. Twee overwinterende vrouwtjes van *Ancistrocerus nigricornis* (November 2014). Alle foto's René Veenendaal.

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Figure 2. Hibernating female of *Chrysis terminata* (november 2014).
Figuur 2. Overwinterend vrouwtje van *Chrysis terminata* (November 2014).

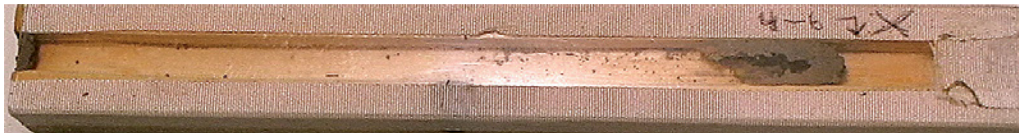

Figure 3. A closed nest of *Ancistrocerus nigricornis* with only one incomplete cell. In the space before the cell *Chrysis terminata* placed an egg.
Figuur 3. Een gesloten nest *Ancistrocerus nigricornis* met slechts een onvoltooide cel. In de lege ruimte ervoor ligt het ei van *Chrysis terminata*.

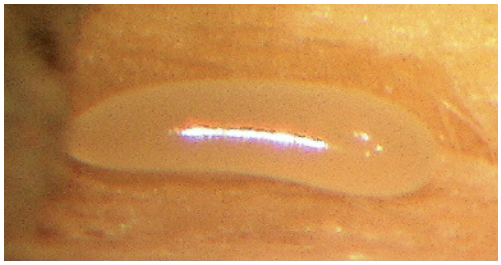

Figure 4. Egg of *Chrysis terminata* placed in the empty space before the first cell of the nest of *Ancistrocerus nigricornis.*
Figuur 4. Het ei van *Chrysis terminata* gelegd in de lege ruimte voor de eerste broedcel van *Ancistrocerus nigricornis.*

Figure 5. Egg of *Ancistrocerus nigricornis* (left) and *Chrysis terminata* (right).
Figuur 5. Ei van *Ancistrocerus nigricornis* (links) en *Chrysis terminata* (rechts).

found the nest in the right condition. This took about three to four minutes. A quick look in the nest learned that the cuckoo wasp had crawled to the back of the cell and was sitting on the partition wall.

After the cuckoo wasp came out it immediately flew away. To see what exactly had happened, the nest was removed and viewed under a binocular. The expectation was to find an egg in the most recent breeding cell, but that was not the case. The wasp had drilled the partition wall and had deposited the egg in the second last breeding cell.

In the last five years eleven observations on egg laying behaviour of *C. terminata* have been done. Ten times the egg was placed behind the partition in the closed cell and only once in the current cell. It seems this is the normal procedure and it could be an explanation for the relatively long ovipositor.

A point of interest is that in nine out of the eleven observations the returning female *Ancistrocerus* was able to detect that her nest was infected by *Chrysis*. The female became very agitated and crawled several times back and forth through the nest, and she also searched between the preys in the nest. However, she never removed or destroyed the egg of the cuckoo wasp, not even in the singular case when the egg was laid in the current cell. It usually ended with closing the nest with a final gag, without further providing it with more prey. Laying the egg in the second last breeding cell can be useful because there is enough food. However, the result can also turn negative, see

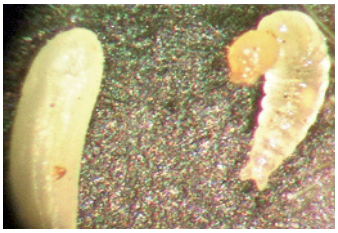

Figure 6-7. *Chrysis terminata* larva, 6. approaching the egg of *Ancistrocerus nigricornis,* 7. sucking on the egg.
Figuur 6-7. *Chrysis terminata* - larve, 6. op weg naar het ei van *Ancistrocerus nigricornis,* 7. zuigt aan het ei.

Figure 8. Cocoon of *Chrysis terminata*.
Figuur 8. Cocon van *Chrysis terminata*.

fig. 3, 4. In this case the cuckoo wasp placed her egg in the empty place behind the first cell (without prey).

The observations leads to the following general picture of the breeding behaviour of *C. terminata*. The egg of the potter wasp hangs on a short thread in front of the prey and the egg of the cuckoo wasp is directly behind the partition in the next breeding cell. This is the same situation as was found in a nest of *Symmorphus bifasciatus* (Linnaeus, 1761) that had been parasitized by *Chrysis angustula* Schenk, 1856 (Veenendaal 2013). The egg of *C. terminata* is about 1.6 mm long, shiny white and narrower than the egg of the potter wasp, which is about 2 mm long (fig. 5). The egg of the cuckoo wasp hatches after about two days, about a day faster than the egg of the potter wasp. The larva of the cuckoo wasp is very mobile and starts to crawl directly through the cell and tries to get to the egg of the potter wasp at the back of the cell. When she finds it she begins to suck on it (fig. 6, 7). In figure 6 the split last segment is visible. This probably gives the larve a greater mobility. The split disappears after moulting one or two times.

After two days, the egg of the host is eaten and the larva begins to eat from the food supply. It can eat from different preys the same time. The author saw this earlier at *Hedychrum rutilans* Dahlbom, 1854, and seemed to be part of the digestion process, in which saliva was released on the prey, which could later be eaten more easily. After nine to ten days the larva has completely consumed the food supply and she starts to coat the walls of the cell with a thin layer of silk. The next day, the larva empties its intestines in a corner of the cell and spun wires are inserted through the cell. After this, a cocoon is made, using the previously applied threads. At first the cocoon is light in color, but the next days it turns dark brown (fig. 8). Fourteen days later, the cocoon shows the contours of two eyes, so the larva has pupated. After another sixteen days, a female of *C. terminata* crawled out of the cocoon. The development from egg to imago took 43 days (at room temperature ± 20 °C). To identify the cuckoo wasp, the table of van der Smissen was used (van der Smissen 2010).

ACKNOWLEDGEMENTS

Sincere thanks are due to Jeroen de Rond for reading the manuscript and his suggestions.

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SAMENVATTING

Het voortplantingsgedrag van *Chrysis terminata* in nesten van *Ancistrocerus nigricornis* (Hymenoptera: Chrysididae, Eumenidae)

De afgelopen vijf jaar zijn er observaties gedaan aan nesten van *Ancistrocerus nigricornis* die door de goudwesp *Chrysis terminata* geparasiteerd waren. Deze twee wespen hebben dezelfde levenscyclus. Ze vermenigvuldigen zich in het voorjaar, de nieuwe generatie komt uit in de zomer en de bevruchte vrouwtjes overwinteren. De goudwesp kiest ervoor om haar ei te leggen als de nieuwe broedcel reeds een aantal prooien bevat. Er werd verwacht dat de wesp haar ei in de in aanbouw zijnde cel zou plaatsen, maar dat was slechts in een van de elf observaties het geval. In de tien andere observaties bleek de goudwesp langs de binnen gebrachte prooien te kruipen naar de achterwand. Deze werd met de legboor doorboord en het ei werd in de achterliggende cel gedeponeerd. Hierbij ontstond dezelfde situatie als eerder werd gevonden in een nest van *Symmorphus bifasciatus*, dat was geparasiteerd door *Chrysis angustula* (Veenendaal 2013). Na twee dagen komt het ei van de goudwesp uit. De larve begint direct via de voedselvoorraad naar de achterzijde van de cel te kruipen om daar het ei van de gastheer te consumeren. Hierna worden de door de gastheer binnen gebrachte prooien geconsumeerd. Na circa tien dagen is de larve volgroeid en begint deze de cel met een dun spinsellaagje te bekleden. De darm wordt geleegd en er worden draden dwars door de cel gesponnen, waarna de cocon wordt gemaakt. Na ongeveer zes weken komt de nieuwe generatie uit de cocon tevoorschijn.

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