

Research on the distribution of *Sesia bembeciformis* (Lepidoptera: Sesiidae) in Belgium, the Netherlands and northern France

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Abstract. Between 2014 and 2019 the author investigated the distribution of the clearwing moth *Sesia bembeciformis* (Hübner, 1806) in Belgium, The Netherlands and northern France. For that purpose, traces of the larvae were sought, especially in *Salix caprea* (Linnaeus, 1753). In this paper, these traces are described and compared to traces of other insects in the same plant species, in particular the moths *Sesia apiformis* (Clerck, 1759) and *Cossus cossus* (Linnaeus, 1758) and the longhorn beetle *Aromia moschata* (Linnaeus, 1758).

Samenvatting. Tussen 2014 en 2019 onderzocht de auteur de verspreiding van de wespvlinder *Sesia bembeciformis* (Hübner, 1806), gekraagde wespvlinder, in België, Nederland en Noord-Frankrijk. Hiertoe werd gezocht naar sporen van rupsen, voornamelijk in *Salix caprea* (Linnaeus, 1753). Deze sporen worden in deze publicatie beschreven en vergeleken met sporen van andere insecten in dezelfde plantensoort en vooral de vlinders *Sesia apiformis* (Clerck, 1759) en *Cossus cossus* (Linnaeus, 1758) en de boktor *Aromia moschata* (Linnaeus, 1758).

Résumé. Entre 2014 et 2019 l'auteur avait investigué la distribution de la Sésie *Sesia bembeciformis* (Hübner, 1806) en Belgique, Le Pays-Bas et le Nord de la France. À cette fin, des traces de chenille ont été recherchées, principalement dans *Salix caprea* (Linnaeus, 1753). Ces traces sont décrites dans cette publication et comparées aux traces d'autres insectes dans la même espèce de plante, en particulier les papillons *Sesia apiformis* (Clerck, 1759) et *Cossus cossus* (Linnaeus, 1758) et le Cerambycide *Aromia moschata* (Linnaeus, 1758).

Key words: *Aromia moschata* – *Cossus cossus* – distribution – larva – *Salix caprea* – *Sesia apiformis* – traces.

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Introduction

From April 2014 until March 2019 the author looked for traces of the clearwing species *Sesia bembeciformis* (Hübner, 1806) in Belgium, The Netherlands and northern France to get an idea of the abundance and distribution of the species in that area (Fig. 1). In this paper, the results of this investigation are presented. The different life stages of the species are described and the methods used for finding traces of those stages are explained. In addition, traces of the larvae of *S. bembeciformis* are compared with those of other insects in the same food plant species.

Description

Sesia bembeciformis is a large clearwing species (wingspan 28–43 mm) with broad yellow bands on the abdomen. It differs from the related *Sesia apiformis* (Clerck, 1759) in the presence of a yellow patagial collar and by the absence of a yellow area on the front part of the tegulae (Laštůvka & Laštůvka 2001).

Biotope and food plants

Sesia bembeciformis is found in meadows, forest edges and river bank vegetation. Host plants are *Salix* spp., especially *Salix cinerea* L. and *S. caprea* L. (Laštůvka & Laštůvka 2001). In the area investigated, most attention was paid to *S. caprea*.

Until 2018, *S. bembeciformis* was thought to be a rare species in The Netherlands, Belgium and northern France.

In spite of its size, this clearwing moth, like other Sesiidae, is seldom recognised in the field on account of

its mimicry and because, having a reduced proboscis, it is not attracted to flowers. Furthermore, the larvae of all Sesiidae are internal feeders and will be overlooked unless specially sought after.



Fig. 1. Copula of *S. bembeciformis*, Belgium, OV, Baasrode, 10.vi.2018.
© Rudi Goossens.

However, with some practice, workings of the caterpillars are fairly easy to find, and after five years of searching for larvae in *S. caprea*, it has become clear that the species is quite common in the investigated area, usually in humid biotopes where *S. caprea* is present (Fig. 2).



Fig. 2. Humid reed land with *S. caprea* in the Vlassenbroekse Polder (Belgium OV), an ideal biotope for *S. bembeciformis*. © Rudi Goossens.

The author also found the species regularly in drier and more elevated biotopes. It is striking that it is often observed in larger numbers in places where the vegetation is not very dense. Reed lands with scattered trees and especially trees with little undergrowth at the base, being more sun-exposed, seem to be favourite places for ovipositing (Fig. 3).



Fig. 3. Solitary *Salix caprea* with traces of *S. bembeciformis* on a bare substratum. © Rudi Goossens.

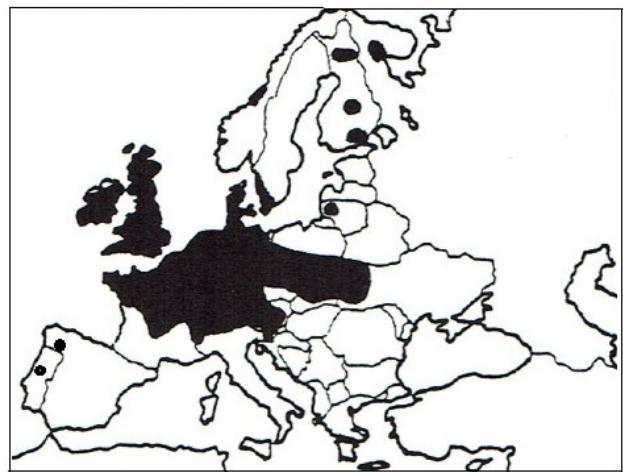
Investigation on distribution

Distribution in Europe

Sesia bembeciformis is widely distributed in western and northern Europe, in western and Northern Ireland, in Great Britain, Scandinavia and the Baltic States and as far as north-western Russia. Southwards it reaches Central France and the Alps towards Slovenia. Eastward, it can be

found as far as western Ukraine and Belarus (Laštůvka & Laštůvka 2001) (Map 1.).

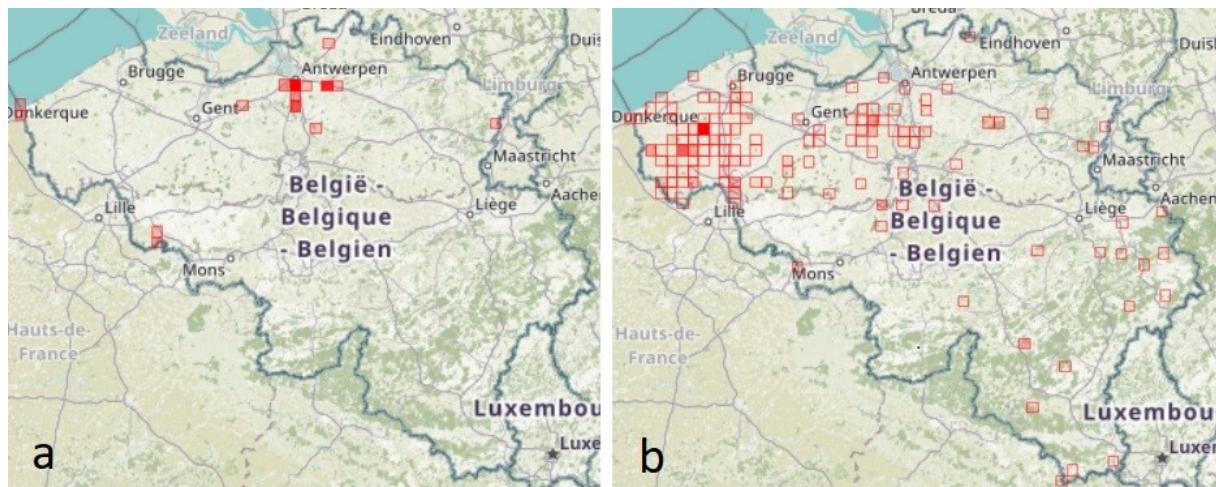
In neighbouring Germany, the species is found in all the federal states (Kallies 1997).



Map 1. Distribution of *S. bembeciformis* in Europe, following Laštůvka & Laštůvka (2001, 2014).

Distribution in Belgium

Before 2012, there were not many published records of *S. bembeciformis* in Belgium, and the species was thought to be rare. Since then, by looking for traces, especially in *S. caprea*, the species was found by the author and other observers in the majority of the biotopes where *S. caprea* is present, and it is certainly widespread and not uncommon in the country.

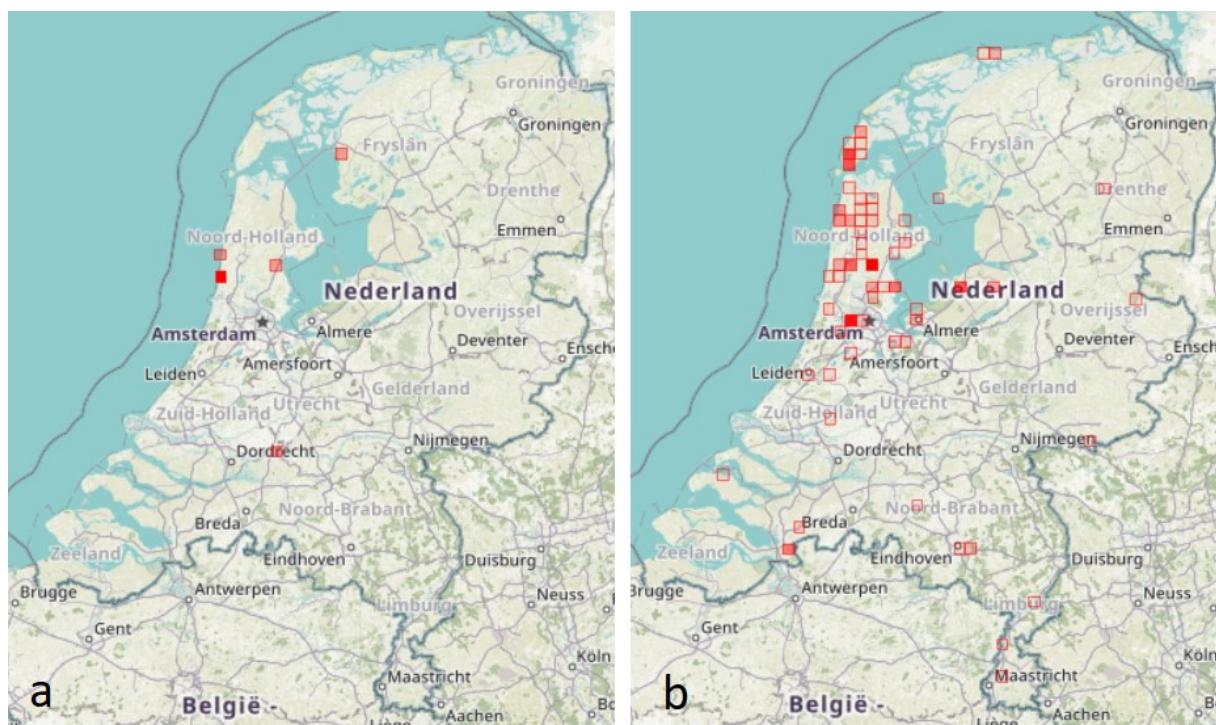


Map 2. Observations of *S. bembeciformis* in Belgium according to waarnemingen.be before 2012 (a) and after 2012 (b).

Distribution in The Netherlands

In The Netherlands, too, the species was considered to be rare until now (website Vlinderstichting). In recent years, the species has been observed far more often and in more scattered locations throughout the

country, surely as a result of a more intensive searching by just a few people (Waarneming.nl) (Map 3). The author recently visited three biotopes with *S. caprea* in the southern part of the Netherlands and traces of *S. bembeciformis* were found in all of them.



Map 3. Observations of *S. bembeciformis* in The Netherlands according to waarneming.nl before 2012 (a) and after 2012 (b).

Distribution in France

In France, until 2010, the species had only been observed in the Departments Haut-Rhin, Loire, Nord, Loire-Atlantique, Indre, Maine-et-Loire and Pas-de-Calais (Crégu 2015). Subsequently, it was also found in Seine-et-Marne, Puy-de-Dôme and Rhône (Table 1).

During a trip in Bretagne (Brittany) in 2018, the author found traces of *S. bembeciformis* in Quédillac (Dep.

Rennes), Plogonnec (Dep. Finistère), Guidel (Dep. Morbihan) and Plouay (Dep. Morbihan). In the last location, an exuvium was found (Fig. 4). Traces of larval activity were found in all suitable-looking biotopes that were investigated. The author therefore concludes that *Sesia bembeciformis* is a common and widespread species in France as well, at least in the northern part of the country (Map 4).

Table 1. Known observations of *Sesia bembeciformis* per department in France.

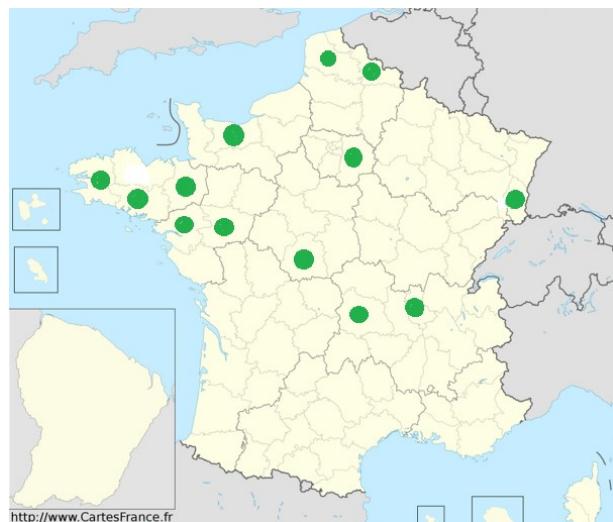
| Departement | Most recent observation (with source) |
|------------------|---------------------------------------|
| Seine-et-Marne | 2017 (lepinet.fr) |
| Calvados | 2016 (observation.org) |
| Puy-de-Dôme | 2014 (lepinet.fr) |
| Haut-Rhin | 2011 (lepinet.fr) |
| Pas-de-Calais | 2010 (observation.org) |
| Nord | 2007 (lepinet.fr) |
| Rhône | 2007 (lepinet.fr) |
| Loire-Atlantique | 1982 (lepinet.fr) |
| Indre | before 1913 (lepinet.fr) |
| Maine-et-Loire | 1886 (lepinet.fr) |

Table 2. New observations of *Sesia bembeciformis* by the author in 2018.

| | |
|--------------------------|------|
| Rennes: Quédillac | 2018 |
| Finistère: Plogonnec | 2018 |
| Morbihan: Guidel, Plouay | 2018 |



Fig. 4. Exuvium of *Sesia bembeciformis* in *Salix caprea*, France, Dep. Morbihan, Plouay, 5.vii.2018. © Rudi Goossens.



Map 4. Observations of *S. bembeciformis* per department in France up to 2018.
http://www.CartesFrance.fr

Life cycle and finding traces of larvae

In captivity, three fertilised females each produced about two hundred eggs (Fig. 5). Eggs are usually



Fig. 5. Eggs of *Sesia bembeciformis* on the bark of *S. caprea*, Belgium, OV, Baasrode, 11.vi.2018. © Rudi Goossens.



Fig. 6. Young larva entering the carved wound in the bark, Belgium, OV, Baasrode, 25.vi.2018. © Rudi Goossens.

deposited on the lower part of the trunk of the foodplant. After about 14 days the larvae hatched.

In an experiment, three of the larvae were placed on a living trunk of *S. caprea*. For several minutes, the larvae crawled back and forth, and only when a wound was carved into the bark, the larvae began to penetrate

it (Fig. 6). After three weeks, a lot of frass had appeared from the wound. Such frass can also be recognised in the field (Fig. 7).



Fig. 7. Frass from a young larva protruding from the wound carved in the bark, Belgium, OV, Baasrode, 23.vii.2018. © Rudi Goossens.

During the first year, the larvae live under the bark and produce a lot of frass (Fig. 8). Later on, they penetrate deeper into the trunk and usually, but certainly not always, they move to the roots. If a tree is sawn off just above ground level, the galleries are easily seen (Fig. 9).



Fig. 8. One-year-old larva of *Sesia bembeciformis* under the bark. © Rudi Goossens.



Fig. 9. Galleries of *S. bembeciformis* in a *Salix caprea* trunk. © Rudi Goossens.

Before the final hibernation (Fig. 10), the larva prepares an exit hole in the trunk and a gallery above it where it spins a cocoon to pupate after spring (Fig. 11).



Fig. 10. A two-year-old larva of *Sesia bembeciformis*. © Rudi Goossens.

Because of the position of the gallery, the fully grown larva, and subsequently the pupa, is positioned head down.



Fig. 11. An opened cocoon with a pupa of *Sesia bembeciformis*. © Rudi Goossens.

The larva leaves a thin layer of bark covering the future exit hole as a kind of hatch. This membrane often dries and falls off during winter (Fig. 12).

From measurements it can be concluded that the exit hole is almost always situated less than 15 cm above ground level, often very near to and sometimes even just below it. The gallery with the cocoon was always located between 6 mm and 50 mm deep, depending to some extent on the thickness of the tree.

From measurements made by the author, the lowest part of the cocoon was always situated just above or up to 12 cm above the exit hole.

Trees with a diameter between 15 and 20 cm appear to be preferred.



Fig. 12. Hatching pupa of *Sesia bembeciformis*, ready to protrude from the exit hole. © Rudi Goossens.

Very often one can find, above the exit hole, another hole hammered by a woodpecker to extract the larva or pupa from its cocoon (Fig. 13).



Fig. 13. Exit holes from *Sesia bembeciformis* with holes made by a woodpecker (blue circles). © Rudi Goossens.

Some exit holes originate from previous years, but in younger trees with smooth bark, further growth of young wood causes them to slowly close up again. (Fig. 14).



Fig. 14. Old exit holes of *S. bembeciformis* that closed again. © Rudi Goossens.

Finding imagines

Imagines can be found in June and July by inspecting the lowest parts of the trunks of *S. caprea* in the early morning. All ten bred imagines hatched between 7.00 and 8.45 am. (Fig. 15).



Fig. 15. A female of *Sesia bembeciformis* on the lowest part of a trunk of *Salix caprea*. © Rudi Goossens.

In order to establish the presence of *S. bembeciformis* in an area, one can also use a reared female as a bait (Fig. 16). In warm weather, the female bulges a pheromone gland (Fig. 16) from the abdomen to attract males (Fig. 17). During one such investigation, males were attracted between 9.30 and 10.30 am.



Fig. 16. Female of *Sesia bembeciformis* bulging its pheromone gland. © Theo Garrevoet.



Fig. 17. A male of *S. bembeciformis* attracted by pheromones from the female (behind gauze). © Rudi Goossens.

An artificial pheromone for *S. bembeciformis* is currently under development and research to optimise the composition will be continued in the near future in collaboration with Pherobank BV (Wijk-bij-Duurstede, The Netherlands).



Fig. 18. *Salix caprea* with traces of *Cossus cossus*. © Rudi Goossens.

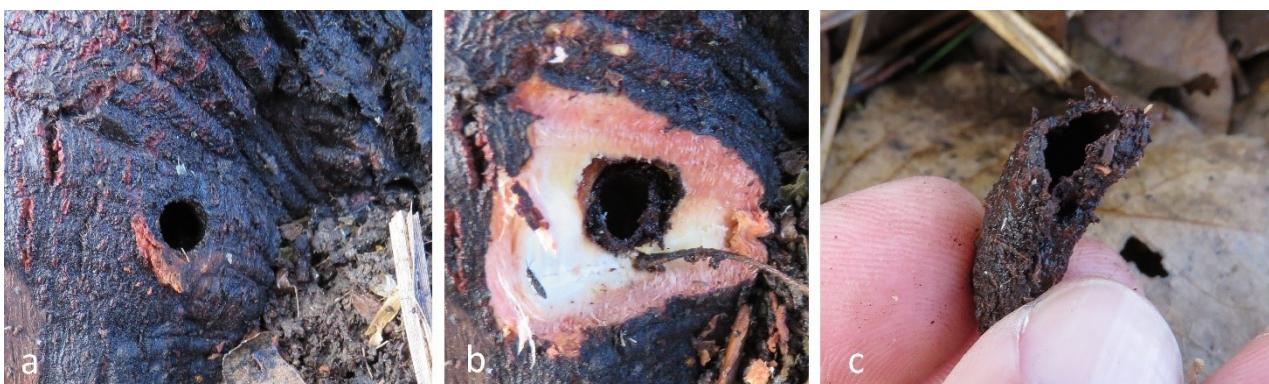


Fig. 20. Exit hole of *Sesia apiformis* in *Salix caprea* with cocoon. © Rudi Goossens.

However, the pheromone for the banana moth (*Opogona sacchari*) has already been shown to be an attractant for this *Sesia* species.

Comparison with traces of other insects in sallows

Holes in a trunk of *S. caprea* might also be made by larvae of *Cossus cossus* (Linnaeus, 1758). But behind the exit hole of *S. bembeciformis* there is just a fairly small corridor, the galleries made by the larvae of *C. cossus* cause sheer havoc in the wood (Fig. 18).

The larvae of the musk beetle, *Aromia moschata* (Linnaeus, 1758) also live in trunks of willows and sallows. They can easily be distinguished from those of *S. bembeciformis* by the absence of prolegs and having the typical form of a longhorn beetle larva (Fig. 19).

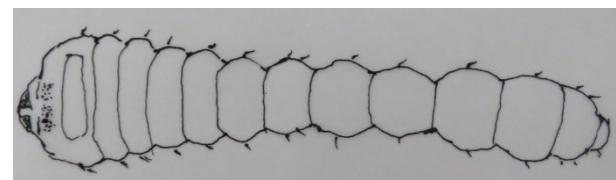


Fig. 19. Larva of *Aromia moschata*. © Rudi Goossens.

In the literature, it has been stated that the rather similar *S. apiformis* is occasionally found in *Salix*. The author indeed found once an exit hole of *S. apiformis* (photos) in *Salix caprea*. However, the corridor with the cocoon of *S. apiformis* is always found **underneath** the exit hole, which is an easy way to distinguish the traces from those of *S. bembeciformis* (Fig. 20). For that reason, the full-grown larva of *S. apiformis*, and hence the pupa, is positioned head up.

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Boekbespreking

Pähler R., Dudler H. & Hille A. 2019: *Das stille Sterben der Schmetterlinge / The silent demise of butterflies and moths*. 17 × 24,5 cm, 336 pagina's, 267 afbeeldingen in kleur, uitgegeven door de auteurs i.s.m. Arbeitsgemeinschaft Rheinisch-Westfälischer Lepidopterologen e.V., te bestellen bij Rudolf Pähler, Arndtstrasse 50, D-33415 Verl, rudolf@paehler.biz, gebonden, 29,80 € (ISBN niet beschikbaar).



Niet alleen wetenschappelijk werkende beroepsentomologen, maar ook ernstige citizen scientists en zelfs het grote publiek zijn er zich van bewust geworden dat er iets mis is met de natuur. Vooral de mensen uit de oudere generaties herinneren zich nog de weelderige wegbermen, de weidse weiden en de bloemrijke bosranden waar het wemelde van de vliners en andere insecten, achterna gezeten door een al even talrijke schare aan vogels. Zij zagen die overvloed aan leven eerst langzaam, maar stilaan in steeds sneller tempo, afnemen en moeten nu tevreden zijn met het opmerken van enkele exemplaren van de meest gewone soorten, terwijl vele van de vroegere vogels al helemaal zijn verdwenen.

Terwijl iedereen wel een algemeen idee heeft van de oorzaken van deze achteruitgang zijn er toch nog maar weinig specifieke studies over verricht en als die al zijn uitgevoerd concentreerden ze zich meestal op enkele "exclusieve" soorten die in een bijzonder biotoop voorkomen, op invasieve exoten of op soorten die op de een of andere manier reeds dikwijs in de aandacht kwamen van natuurliefhebbers, terwijl het brede publiek er hoogst waarschijnlijk nog nooit had van gehoord. Zulke soorten zijn natuurlijk van uitzonderlijk belang voor de beschrijving van de biodiversiteit van een bepaald gebied en ze tonen de rijkdom aan van de natuur in een bepaald land, maar ze gaan voorbij aan het "stille sterren van de vliners".

De drie auteurs hebben er elk meer dan 50 jaar ervaring met vliners opzitten en naast hun eigen notities hebben ze verscheidene databanken geconsulteerd met waarnemingen in de periode 1975–2017. In de keuze van de besproken vlinersoorten hebben ze een indeling gemaakt in 4 categorieën: dagvlinders (met inbegrip van 1 *Zygaena*-soort), soorten van een open cultuurlandschap, soorten van een half-open boslandschap en soorten die eerder aan bossen verbonden zijn. Elke soort wordt op dezelfde wijze besproken: leefgebied, pre-imaginale stadia en voedselplant(en), verspreiding in Europa en meer gedetailleerd in het studiegebied, vliegperiode, variabelen van weer en klimaat, resultaten van de trendanalyse, bijzonderheden en algemene bemerkingen.

Bij de behandeling van de soorten horen telkens enkele afbeeldingen: een foto van een exemplaar in zijn biotoop, een verspreidingskaart van Rheinland-Westfalen, een fenologiediagram, een diagram van de lange-termintrend en een diagram van de Log-lineaire trend. Vooral op deze laatste is bij de meeste soorten duidelijk met een rode lijn aangegeven dat de soort achteruit gaat. Slechts 4 van de bestudeerde soorten blijken eerder stabiel te zijn of er voorwaar op vooruit te gaan: icarusblauwtje, gerande spanner, gerimpelde spanner en donkere marmeruil.

In een tweede deel van dit boek worden de factoren besproken die aan de basis liggen van dit algemene "stille sterren". Kort wordt ingegaan op de klimaatveranderingen en hoe die de opeenvolgende generaties van een vlinersoort beïnvloeden. Dé grote boosdoener is volgens de auteurs echter de geïndustrialiseerde landbouw, met als hoofdfactoren de schaalvergroting van de akkers, het overmatig gebruik van pesticiden en meststoffen. Zij stellen voor om de landbouw op een ecologisch verantwoorde manier te herstructureren wat heel wat veranderingen in de richtlijnen van de Europese Unie veronderstelt.

Het boek is keurig uitgegeven en leest redelijk vlot (Duits). Het zou interessant kunnen zijn om aan de hand van dit voorbeeld enkele "gewone" vlinersoorten in België aan een gelijkaardig onderzoek te onderwerpen.

Willy De Prins