Netherlands Food and Consumer
Product Safety Authority
Ministry of Agriculture,
Nature and Food Quality

Quick scan for members of the *Neoleucinodes elegantalis* species complex

National Plant Protection Organization, the Netherlands

Quick scan number: QS2024ENT004

Quick scan date: 5 December 2024

No.	Question	Quick scan answer for members of *Neoleucinodes elegantalis* species complex
1.	What is the scientific name (if possible up to species level + author, also include (sub)family and order) and English/common name of the organism? *Add picture of organism/damage if available and publication allowed*.	*Neoleucinodes elegantalis* s.l. (Lepidoptera: Crambidae). *Neoleucinodes elegantalis* was previously known as one species and is regulated as such in the EU. However, molecular analyses shows that it is a species complex (see Question 2). Two species are distinguished in this Quick scan: *N. elegantalis* cluster A and *N. elegantalis* cluster B. Common names of *N. elegantalis*: tomato fruit borer, eggplant moth
2.	What prompted this quick scan? *Organism detected in produce for import, export, in cultivation, nature, mentioned in publications, e.g. EPPO alert list, etc.*	Molecular analyses of *Neoleucinodes* specimens intercepted from Colombia/Ecuador versus Suriname reveal two distinct species that coincide with samples identified as *Neoleucinodes elegantalis* in online molecular databases (Fig. 1). Both species are morphologically indistinguishable with current knowledge. It is unclear which of the two species holds the name '*Neoleucinodes elegantalis' sensu stricto* and therefore we consider both species members of the *Neoleucinodes elegantalis* species complex, or *N. elegantalis* s.l. We provisionally label the species intercepted from Colombia/Ecuador '*Neoleucinodes elegantalis* cluster A' and the Suriname species '*Neoleucinodes elegantalis* cluster B'. Discovery of the latter species prompted this quick scan. *Neoleucinodes elegantalis* is an EU quarantine pest (IIA); at the moment of listing it was not known as a species complex.

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		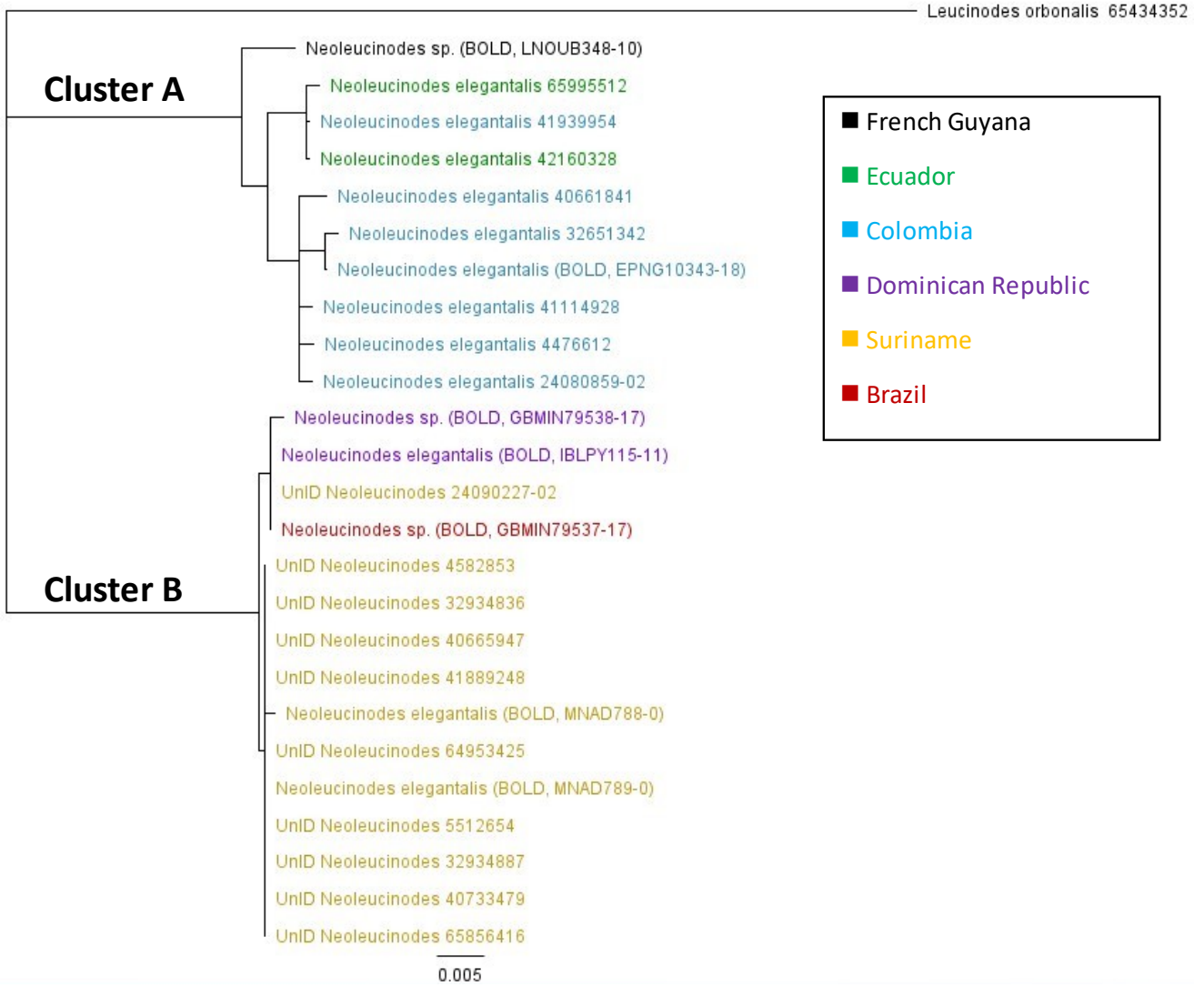 Figure 1: Alignment of *Neoleucinodes* samples based on COI sequences. Data from NPPO of the Netherlands and Barcode Of Life Data system (BOLD, https://www.boldsystems.org/) (Ratnasingham & Hebert, 2007)showing a dissimilarity of around 5% between the two clusters.
3.	Wat is the risk assessment area?	The risk assessment area is the territory of the European Union (EU 27)

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4.	What is the current area of distribution?	Based on available molecular data in the Barcode Of Life Data system (BOLD, https://www.boldsystems.org/) (Ratnasingham & Hebert, 2007): - *N. elegantalis* cluster A: Ecuador, Colombia, French Guiana[1] - *N. elegantalis* cluster B: Suriname, Dominican Republic[2], Brazil[2] It is uncertain how both species are distributed. The currently agreed upon distribution of *Neoleucinodes elegantalis* s.l. covers most of South America and several countries in the Caribbean and Central America including Mexico. The distribution in Mexico is not certain, but 'widely distributed' is mentioned by Gilligan & Passoa (2014). Hayden et al. (2013) include the greater Antilles at its most northern occurrence. This assumed distribution is mostly the result of morphological identification and it is uncertain whether this represents one species. [1]The Dutch interception samples of *N. elegantalis* cluster A from Ecuador and Colombia (green and blue in Fig. 1) cluster together with three sequences collected in French Guiana (black in Fig. 1), which neighbours Suriname. [2]The *N.* elegantalis cluster B interception sequences from Suriname (orange in Figure 1) are a close match (less than 0.5% nucleotide difference in the COI barcode) with the sequences below in BOLD, and differ about 5% from *N. elegantalis* cluster A: • two samples originating from Dominican Republic (Dom. Rep.), one of which was intercepted at Schiphol airport in NL (sample ID: BC MTD 01817), • two samples from Brazil, one of which, according to the museum data, was collected at 1,100 m in the Federal District, Central-West Brazil (sample ID: CNCLEP00089274).
5.	What are the host plants?	See EPPO (2020) for host plants of *N. elegantalis* s.l. Host plant information on the individual species is lacking. *Neoleucinodes elegantalis* cluster A has been intercepted on *Solanum betaceum* (tamarillo) and *S. quitoense*. *Neoleucinodes elegantalis* cluster B has been intercepted on *Solanum melongena* (eggplant) and *S. macrocarpon*. But these differences may be more due to different plant species imported from the different counties rather than an indication of differences in host range between the two species.
6.	Does the organism cause any kind of plant damage in the current area of distribution and/or does the consignment demonstrate damage suspected to have been caused by this organism? *Yes/no + plant species on which damage has been reported + short description of symptoms.* *Please indicate also when the organism is otherwise harmful (e.g. predator, human/veterinary pathogen vector, etc.).*	Yes, see EPPO (2020). It is unknown whether both species cause different degrees of damage. Damage by *N. elegantalis* cluster B observed in the intercepted eggplant fruits from Suriname was identical to the damage caused by *N. elegantalis* s.l. described by EPPO (2020). Larval feeding of *N. elegantalis* s.l. results in direct yield losses as well as indirect losses through secondary infection of the damaged fruits (EPPO, 2020).

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7.	Assess the probability of establishment in the Netherlands (NL) (i.e. the suitability of the environment for establishment). a. In greenhouses b. Outdoors c. Otherwise (e.g. storage facilities, human environment)	Establishment in NL is unlikely: • Either species is unlikely to establish in greenhouses as for *N. elegantalis* s.l. (EPPO, 2014); • Climate conditions outdoors are unsuitable as for *N. elegantalis* s.l. (EPPO, 2014).
8.	Assess the probability of establishment in the EU (i.e. the suitability of the environment for establishment).	Uncertain. Individual species within *Neoleucinodes elegantalis* s.l. may have different climatic requirements for establishment. The majority of the distribution area of the complex is (sub)tropical (EPPO, 2014). However, this complex is also present in areas with a more temperature climate including dry regions in Argentina with a mean annual rainfall of 608 mm (erroneously indicated as mean monthly rainfall in the PRA) similar to that in the Mediterranean region (EPPO, 2014). Therefore, EPPO (2014) assessed the likelihood of establishment of *N. elegantalis* s.l. (which included all populations indicated as *N. elegantalis* at that time) to be 'moderate' for the Mediterranean region and Portugal. Based only on the limited molecular data (see Fig. 1): both *N. elegantalis* cluster A and B occur in countries with a predominantly tropical climate. The current distribution of the two species may, therefore, be limited to tropical climate zones (Köppen-Geiger zones Af, Am and Aw). However, *N. elegantalis* cluster B occurs in Brazil which also has areas with a humid subtropical climate and an oceanic climate (Köpper-Geiger zones Cfa and Cfb, respectively). Tropical climate zones do not occur in the EU but Cfa- and Cfb-climate zones do. Thus, without further information about the distribution of both species and their climatic requirements for establishment, it remains uncertain whether *N. elegantalis* clusters A and B can establish in the EU. It is especially uncertain whether it can survive periods without a host plant (carrying fruits). Within *N. elegantalis* s.l. more species clusters might occur but the extent of the *N. elegantalis* species complex is currently unknown.
9.	What are the possible pathways that can contribute to spread of the organism after introduction? How rapid is the organism expected to spread (by natural dispersal and human activity)?	The pest may spread naturally and by trade of infested fruit.
10.	Provide an assessment of the type and amount of direct and indirect damage (e.g. lower quality, lower production, export restrictions, threat to biodiversity, etc.) likely to occur if the organism would become established in NL and the EU, respectively?	Establishment in NL is unlikely. Establishment in southern EU (if possible, see 8.) may result in yield losses of eggplant and possibly other Solanaceae crops, as with *N. elegantalis* s.l. (EPPO, 2014).
11.	Has the organism been detected on/in a product other than plants for planting (e.g. cut flowers, fruit, vegetables)?	Yes.

<table>
<tr><th>No.</th><th>Question</th><th>Quick scan answer for members of Neoleucinodes elegantalis species complex</th></tr>
<tr><td></td><td>If “no”, go to question 12</td><td></td></tr>
<tr><td>12.</td><td>If the organism has been found on/in a product other than plants for planting (e.g. cut flowers, fruit, vegetables), what is the probability of introduction (entry + establishment)?
Only to be answered in case of an interception or a find.</td><td></td></tr>
<tr><td>13.</td><td>Additional remarks</td><td>In TRACES, N. elegantalis s.l. (as N. elegantalis) has been notified 26 times of which 15 times on S. melongena and S. macrocarpon originating in Suriname (Table 1).

Table 1. Notifications of Neoleucinodes elegantalis s.l. (as N. elegantalis) in TRACES (data retrieved on 4 October 2024)[1].
<table>
<tr><th>Commodity (fruit of)</th><th>Origin</th><th>Number</th></tr>
<tr><td>Capsicum chinense</td><td>Brazil</td><td>1</td></tr>
<tr><td>Cyphomandra</td><td>Colombia</td><td>1</td></tr>
<tr><td>Physalis peruviana/Solanum betaceum/S. quitoense[2]</td><td>Colombia</td><td>1</td></tr>
<tr><td>S. betaceum</td><td>Colombia</td><td>7</td></tr>
<tr><td>S. macrocarpon</td><td>Suriname</td><td>1[3]</td></tr>
<tr><td>S. melongena</td><td>Suriname</td><td>14</td></tr>
<tr><td>S. quitoense</td><td>Ecuador</td><td>1</td></tr>
</table>
[1] The EU platform TRACES includes all notifications of interceptions from EU member states and Switzerland since approximately mid 2020
[2] One consignment, not clear which fruit was found infested
[3] The notification on S. macrocarpon on 23.09.2024 is an error, it should be S. melongena (NPPO-NL)</td></tr>
<tr><td>14.</td><td>Summary and conclusions</td><td>• This Quick scan was prompted by the identification of two separate species within the species complex Neoleucinodes elegantalis s.l. Hitherto, N. elegantalis was considered one species and is currently regulated as such in the European Union based on a Pest Risk Analysis of the European and Mediterranean Plant Protection Organisation (EPPO). However, N. elegantalis appears now to be a species complex. The species identified are indicated as N. elegantalis cluster A intercepted on fruit from Colombia and Ecuador and N. elegantalis cluster B intercepted on fruit from Suriname. It is unclear which species is Neoleucinodes elegantalis s.s.
• Neither of the species is known to be present in the EU.
• It is uncertain whether species within the N. elegantalis species complex have different ecological properties and differ in their risk for the EU.</td></tr>
<tr><td>15.</td><td>References</td><td>EFSA PLH, Bragard C, Baptista P, Chatzivassiliou E, Di Serio F, Gonthier P, Jaques Miret JA, Justesen AF, MacLeod A, Magnusson CS, Milonas P, Navas-Cortes JA, Parnell S, Potting R, Reignault PL, Stefani E, Thulke H-H, Vicent Civera A, Yuen J, Zappalà L, Mally R, Czwienczek E, Gobbi A, López Mercadal J,</td></tr>
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		Maiorano A, Mosbach-Schulz O, Pautasso M, Rossi E, Stancanelli G, Tramontini S & Van der Werf W, 2024. Pest risk assessment of Leucinodes orbonalis for the European Union. EFSA Journal, 22 (3), e8498. Available online: https://doi.org/https://doi.org/10.2903/j.efsa.2024.8498 EFSA PLH, Bragard C, Di Serio F, Gonthier P, Jaques Miret JA, Justesen AF, Magnusson CS, Milonas P, Navas-Cortes JA, Parnell S, Potting R, Reignault PL, Thulke H-H, Van der Werf W, Vicent Civera A, Yuen J, Zappalà L, Gregoire J-C, Malumphy C, Czwienczek E, Maiorano A & MacLeod A, 2021. Pest categorisation of Leucinodes orbonalis. EFSA Journal, 19 (11), e06890. Available online: https://doi.org/https://doi.org/10.2903/j.efsa.2021.6890 EPPO, 2014. Pest Risk Analysis for Neoleucinodes elegantalis. European and Mediterranean Plant Protection Organisation. Available online: https://www.eppo.int/QUARANTINE/Pest_Risk_Analysis/PRA_intro.htm EPPO, 2020. Neoleucinodes elegantalis (NEOLEL) [Web page]. Available online: https://gd.eppo.int/taxon/NEOLEL/datasheet [Accessed: 2024-09-25]. Gilligan TM & Passoa SC, 2014. LepIntercept - An identification resource for intercepted Lepidoptera larvae [Web page]. Identification Technology Program (ITP). Available online: http://idtools.org/id/leps/lepintercept/pdfs/grapholita.pdf Hayden J, Lee S, Passoa S, Young J, Landry J-F, Nazari V, Mally R, Somma L & Ahlmark K, 2013. Digital Identification of Microlepidoptera on Solanaceae [Web page]. Available online: http://idtools.org/id/leps/micro/ [Accessed: 2024-09-25]. Ratnasingham S & Hebert PD, 2007. bold: The Barcode of Life Data System (http://www.barcodinglife.org). Molecular ecology notes, 7 (3), 355-364. Available online: https://doi.org/https://doi.org/10.1111/j.1471-8286.2007.01678.x
16.	**Follow-up measures**	Without further information on the ecology of the individual species, the NPPO will continue to reject consignments that are infested with *N. elegantalis* s.l. (i.e. each species within the complex is considered to be regulated; '*N. elegantalis*' was not known as a species complex at the time the PRA on which the regulation is based was published).