

Research Article

New records of ten non-native insects (Arthropoda: Insecta) from the island of Cyprus

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Abstract

Approximately 14,000 species have been introduced outside their native range to Europe, with some of them becoming invasive as they establish, spread and cause impacts on people and nature. Terrestrial arthropods and particularly insects represent a large percentage of these non-native species, with phytophagous insects largely following the introduction of their host plants to new regions. Situated in the Eastern Mediterranean, the island of Cyprus hosts more than 350 non-native species of insects, with the majority being phytophagous agricultural and horticultural pests. In this study, ten non-native, cryptogenic or data deficient taxa are reported for the first time i.e., harlequin ladybird *Harmonia axyridis* (Coleoptera: Coccinellidae), seed-beetle *Bruchidius siliquastris* (Coleoptera: Chrysomelidae: Bruchinae), coffee bean weevil *Araecerus fasciculatus* (Coleoptera: Anthribidae), true bugs *Corythauma ayyari*, *Stephanitis lauri* (Hemiptera: Tingidae) and *Montandoniola indica* (Hemiptera: Anthocoridae), ringlegged earwig *Euborellia annulipes* (Dermaptera: Anisolabididae), spiderling plume moth *Megalorhipida leucodactylus* (Lepidoptera: Pterophoridae), as well as flies *Horidiplosis ficifolii* (Diptera: Cecidomyiidae) and *Phytoliriomyza jacarandae* (Diptera: Agromyzidae). Furthermore, we confirm the presence of the pyriform scale insect *Protopulvinaria pyriformis* (Hemiptera: Coccidae) on Cyprus. These species are considered likely to be established with a wide distribution on the island, given the common use of recorded host plants as ornamentals in both urban and rural parks and gardens. Their observed and potential environmental and socioeconomic impacts are discussed.

Key words: alien species, biological invasions, exotic species, faunistics, taxonomy

Introduction

More than 14,000 non-native species can be found in Europe (EASIN 2025), with their ever-increasing introductions being facilitated by globalisation, including international trade (Hulme 2009; Seebens et al. 2017; Seebens 2019). Terrestrial arthropods, particularly insects, represent a large percentage of these non-native species being introduced either intentionally as biological control agents or unintentionally, mostly as contaminants of food, plants and nursery material, and to a lesser extent through the transportation of habitat material (Pergl et al. 2020). The transport of plants outside their native range has been acknowledged as a major driver of insect invasions worldwide, with many species following their introduced host plants (Bonnamour et al. 2023).

The island of Cyprus is situated at the heart of the Eastern Mediterranean, within the Mediterranean biodiversity hotspot (Myers et al. 2000). Despite its importance as a bird migration pathway and an endemism centre for plants and a variety of terrestrial vertebrates (Hadjisterkotis and Masala 1995; Hand et al. 2011, 2019; Cheikh Albassatneh et al. 2021), the island is also prone to biological invasions. According to the most recent inventory of non-native insects, 349 species were catalogued for the island (Demetriou et al. 2023), representing almost one fourth of all non-native species on the island (Demetriou et al. 2025). Currently exceeding 400 species, the number of non-native insect species is still on the rise (Demetriou and Koutsoukos *unpublished data*). Although their impacts require further in-depth research, many are predicted to adversely affect society and the economy, being predominantly agricultural and horticultural pests, forestry and urban tree pests, stored product and infrastructure pests and/or species that affect human and animal health, in decreasing order of importance (Demetriou et al. 2023).

In this study, six non-native insects associated with ornamental plants are reported for the first time for the island of Cyprus. Specifically, seed-beetle *Bruchidius siliquastri* Delobel, 2007, true bugs *Corythauma ayyari* (Drake, 1933), *Stephanitis lauri* Rietschel, 2014 (Tingidae) and *Montandoniola indica* Yamada, 2011 (Anthocoridae), as well as two new non-native flies, *Horidiplosis ficifolii* (Harris, 2003) (Cecidomyiidae) and *Phytoliriomyza jacarandae* Steyskal & Spencer, 1978 (Agromyzidae). Additionally, we confirm the presence of the pyriform scale insect *Protopulvinaria pyriformis* Cockerell, 1894 (Hemiptera: Coccidae) on Cyprus. Furthermore, first records for the non-native insects *Harmonia axyridis* (Pallas, 1773) (Coleoptera: Coccinellidae), coffee bean weevil *Araecerus fasciculatus* (De Geer, 1775), ring-legged earwig *Euborellia annulipes* (Lucas, 1847) (Dermaptera: Anisolabididae), and spiderling plume moth *Megalorhipida leucodactylus* (Fabricius, 1794) (Lepidoptera: Pterophoridae) are presented. The status of establishment observed and possible impacts of these invasive non-native species (INNS)

Table 1. Taxonomy, status (NN = non-native, C = cryptogenic, DD = data deficient), year of first record (i.e. detection or observation) and recommendations for future research for all newly recorded species.

Order	Family	Species	Status	Year of first record	Recommendations for further research – Data gaps		
					Monitoring and surveillance	Impact assessment	Clarifying native or non-native status
Coleoptera	Coccinellidae	<i>Harmonia axyridis</i> (Pallas, 1773)	NN	2024	X	X	
Coleoptera	Chrysomelidae	<i>Bruchidius siliquastri</i> Delobel, 2007	NN	2024	X		
Coleoptera	Anthribidae	<i>Araecerus fasciculatus</i> (De Geer, 1775)	NN	2018	X		
Hemiptera	Coccidae	<i>Protopulvinaria pyriformis</i> Cockerell, 1894	NN	1996	X	X	
Hemiptera	Tingidae	<i>Corythauma ayyari</i> (Drake, 1933)	NN	2024	X	X	
Hemiptera	Tingidae	<i>Stephanitis lauri</i> Rietschel, 2014	DD	2025	X	X	X
Hemiptera	Anthocoridae	<i>Montandoniola indica</i> Yamada, 2011	NN	2022	X	X	
Dermoptera	Anisolabididae	<i>Euborellia annulipes</i> (Lucas, 1847)	C	2024	X		X
Lepidoptera	Pterophoridae	<i>Megalorhipida leucodactylus</i> (Fabricius, 1794)	NN	2024	X		
Diptera	Cecidomyiidae	<i>Horidiplosis ficifolii</i> Harris, 2003	NN	2024	X	X	
Diptera	Agromyzidae	<i>Phytoliriomyza jacarandae</i> Steyskal & Spencer, 1978	NN	2024	X	X	

on native biodiversity, society and economies are briefly discussed alongside the importance of citizen science in advancing our understanding of biological invasions.

Materials and methods

Preserved specimens presented herein were opportunistically sampled as by-catch during investigations and material surveys of non-native ants and chalcid wasps of Cyprus in the framework of Darwin Plus projects DPLUS200 and DPLUS202, respectively. Specimens were stored in 70%, 95% ethanol or were dry mounted upon their collection. In the case of Hemiptera, specimens were obtained with the use of an entomological umbrella and in the case of Coleoptera and Diptera by storing infested seed pods and leaves of their host plant in sealed polyethylene bags until the emergence of adult individuals (Protasov et al. 2007). Records of observed specimens already uploaded to the iNaturalist biodiversity data platform were examined and confirmed through expert consultation.

The status of species was assessed as: non-native i.e. truly alien/introduced to the island or cryptogenic i.e. taxa of unknown origin, neither demonstrably native nor introduced. Taxa with an uncertain status at the island level i.e. species whose status should be further investigated at the local level were treated as data deficient (Demetriou et al. 2025).

Results

The taxonomy, distributional data, establishment status and additional notes are provided for each species below. Their taxonomy, status, year of first record and recommendations for future research for all newly recorded species are provided in Table 1.



Figure 1. *In-situ* photographs of *Harmonia axyridis* (Coleoptera: Coccinellidae) (A) and *Megalorhipida leucodactylus* (Lepidoptera: Pterophoridae) (B). Photographed by Mr O. Alkan.

Coleoptera

***Harmonia axyridis* (Pallas, 1773) (Coccinellidae)**

(Figure 1A)

Citizen science data: Cyprus, Iskele/Trikomo, Dipkarpaz/Rizokarpaso (35.5986°N, 34.38077°E), 08.vi.2024, obs. O. Alkan, det. O. Alkan & H. E. Roy (<https://www.inaturalist.org/observations/221405936>).

Status: Non-native.

Status of establishment: Unknown (speculated to be established but not confirmed through specimens).

Notes: The harlequin ladybird is regarded as an important INNS across the globe, adversely affecting native taxa and particularly ladybirds, leading to declines in their diversity and distribution (Roy and Brown 2015; Roy et al. 2016). Its distribution and impacts on the island are currently unknown and necessitate further research.

***Bruchidius siliquastris* Delobel, 2007 (Chrysomelidae: Bruchinae)**

(Figure 2A)

Material examined: Cyprus, Paphos, Paphos city, Municipal Gardens (34.773746°N, 32.422341°E), vi.2024, leg. E. Koutsoukos & J. Demetriou, ex. *Cercis siliquastrum* pods.

Status: Non-native.

Status of establishment: Established.

Notes: Presumably native to East Asia, *B. siliquastris* was first described in Europe but thought to have shifted its host plant from some unknown Oriental species of *Cercis* toward *C. siliquastrum* L. (Kergoat et al. 2007). Since then, the species has been detected in numerous European and Mediterranean

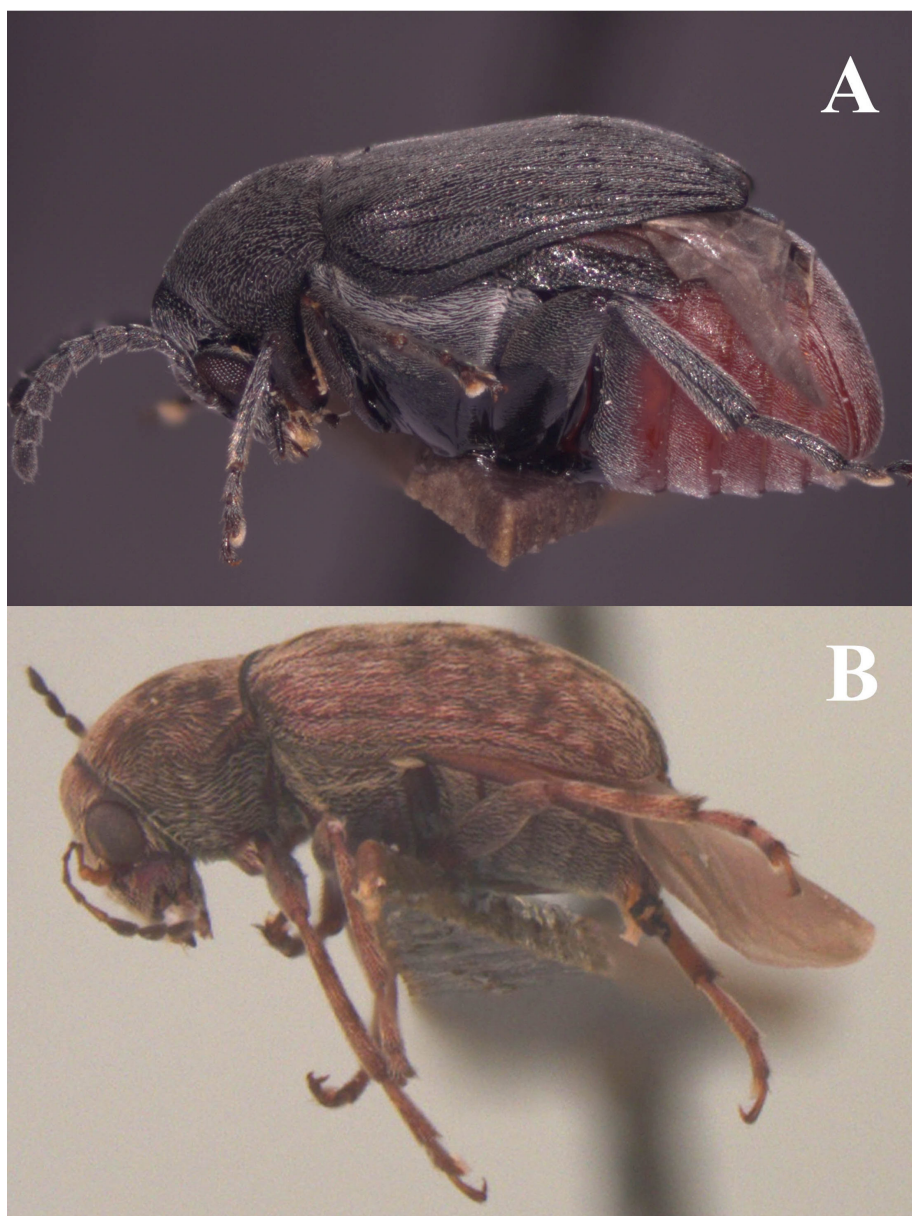


Figure 2. Stereomicroscope photographs of *Bruchidius siliquastrum* (Coleoptera: Chrysomelidae: Bruchinae), photographed by Mr. J. Demetriou (A) and *Araecerus fasciculatus* (Coleoptera: Anthribidae), photographed by Dr. C. Georgiadis (B).

countries, including neighbouring Türkiye (Hizal and Nihan Parlak 2013), and Greece (Gastouniotis et al. 2024). In Cyprus we observed holes on pods of *C. siliquastrum* in urban areas, indicating the presence of a seed-beetle. Nevertheless, no adverse effects on the viability or aesthetic value of *C. siliquastrum* were observed.

***Araecerus fasciculatus* (De Geer, 1775) (Anthribidae)**
(Figure 2B)

Material examined: Cyprus, Paphos, Kato Paphos (34.7588°N, 32.4168°E), 6.vii–13.ix.2018, 20 m alt., leg. J. Demetriou, det. A. Boulas & G. Kakiopoulos.

Status: Non-native.

Status of establishment: Unknown.

Notes: Also known as the coffee bean weevil, it affects a wide range of stored products and some field crops worldwide. In Europe, it has been collected indoors in numerous countries (Sauvard et al. 2010), nevertheless, it has been also reported on some occasions from natural habitats (Koval et al. 2019). The single specimen from Cyprus does not allow us to confirm whether the species is able to colonize natural habitats or is associated with some unknown ornamental plant. However, its socio-economic impacts are predicted to be negligible.

Hemiptera

***Montandoniola indica* Yamada, 2011 (Anthocoridae)**

Material examined: AKROTIRI UK SOVEREIGN BASE AREA, 5 ex. Akrotiri village (34.6031°N, 32.9548°E), 24.viii.2022, leg. J. Demetriou, on *F. microcarpa*. – 4 ex. Akrotiri village (34.6006°N, 32.9592°E), 24.viii.2022, leg. J. Demetriou, on *F. microcarpa* in field near house – 5 ex. Joint Services Health Unit (34.5880°N, 32.9756°E), 24.viii.2022, leg. J. Demetriou, on *F. benjamina* in urban area – PAPHOS, 5 ex., hotel area (34.7698°N, 32.4058°E), 20.viii.2022, leg. J. Demetriou, on *F. benjamina* – 4 ex., Chloraka, Melanos (34.7925°N, 32.4082°E), 19.viii.2022, leg. J. Demetriou, on *F. benjamina* – 5 ex., Chloraka, Melanos (34.7910 °N, 32.4097°E), 19.viii.2022, leg. J. Demetriou, on *F. benjamina* in house garden – 5 ex., Chloraka, Melanos (34.7885°N, 32.4131°E), 20.viii.2022, leg. J. Demetriou, on *F. benjamina* in urban garden – 4 ex., Chloraka (34.7991°N, 32.3974°E), 20.viii.2022, leg. J. Demetriou, on *F. benjamina* in hotel garden – 5 ex., Hotel env. (34.7714°N, 32.4063°E), 20.viii.2022, leg. J. Demetriou, on *F. benjamina* in hotel parking lot – 5 ex., Chloraka, Melanos (34.7915°N, 32.4070°E), 19.viii.2022, leg. J. Demetriou, on *F. microcarpa* in house garden – 5 ex., Chloraka, Melanos (34.7904°N, 32.4129°E), 19.viii.2022, leg. J. Demetriou, on *F. benjamina* in apartments' garden – 5 ex., Chloraka (34.7896°N, 32.4030°E), on *F. benjamina* in parking lot – 5 ex., Chloraka, Melanos (34.7916°N, 32.4116°E), 20.viii.2022, leg. J. Demetriou, on *F. microcarpa* in urban park – 3 ex., Theoskepasti's middle school vic. (34.7763°N, 32.4106°E), 20.viii.2022, leg. J. Demetriou, on *F. benjamina* – LIMASSOL, 4 ex., Kolossi, urban park (34.6706°N, 32.9328°E), 24.viii.2022, leg. J. Demetriou, on *F. microcarpa* – 1 ex., Mesa Geitonia (34.6810°N, 33.0357°E), 31.viii.2022, leg. J. Demetriou, on *F. benjamina* outside church.

Status: Non-native.

Status of establishment: Established.

Notes: The *Montandoniola* specimens from Cyprus are identified as *M. indica*, known from southern India as a predator of gall-forming thrips on black pepper (Yamada et al. 2011). This species was also recently recorded in Syria from *Ficus* spp. (Yaseen Ali and Streito 2019). Our identification is based on the following diagnostic characters: labium with distal third of

segment III and proximal two thirds of segment IV whitish-pale yellow, respectively; fore- and mid tibiae whitish-pale yellow except for darkened base; posteriorly angular ostiolar peritreme; male genitalia with slightly sinuate flagellum; and female copulatory tube distinctly separated from the base of ovipositor, exceeding the anterior margin of sternum VII.

To our knowledge, no other congener shares these characteristics (Pluot-Sigwalt et al. 2009; Yamada et al. 2011). Assuming our identification is accurate, the specimens in Cyprus and Syria seem to be common on *Ficus*, and not peppers, indicating ecological differences from the populations of India. Taking into consideration the deliberate introduction of *Montandoniola* spp. as biological control agents of non-native *Gynaikothrips* spp. (Pluot-Sigwalt et al. 2009) as well as the latter species' adverse effects on the ornamental value of *Ficus* spp. (Reynaud 2010), the presence of *M. indica* in Cyprus is not expected to cause any adverse effects but as observed does not seem to provide sufficient control of *Gynaikothrips* spp.

***Protopulvinaria pyriformis* Cockerell, 1894 (Coccidae)**

Material examined: LIMASSOL, Kato Polemidia, Garyllis linear park (34.6914°N, 33.0151°E), 40 m alt., 10.ix.2025, leg. J. Demetriou & E. Koutsoukos, on *Laurus nobilis* L. in park.

Status: Non-native.

Status of establishment: Unknown.

Notes: According to Jansen and Alferink (2023), *P. pyriformis* was intercepted in the Netherlands in 1996, as a contaminant on *Hedera helix* L. from Cyprus. Despite our best efforts to detect records of the species from Cyprus, no data on its presence on the island were uncovered from any books, databases or scientific articles (Georghiou 1977; Pellizzari and Germain 2010; Şişman and Ülgentürk 2010; Ülgentürk et al. 2015; García Morales et al. 2016; Mrabti et al. 2024; EPPO 2025a). As such, we report herein its presence and further spread to urban settings, outside the plant trade. Due to its wide host range the species may become or is probably widespread but was not reported to date. The inspected *L. nobilis* tree was highly infested, being largely covered by the coccid.

***Corythauma ayyari* (Drake, 1933) (Tingidae)**

(Figure 3A)

Material examined: PAPHOS, Chloraka, Melanos (34.7907°N, 32.4124°E), 90 m alt., 16.viii.2024, leg. J. Demetriou. – LIMASSOL, Mesa Geitonia (34.6819°N, 33.0381°E), 17 m alt., 21.viii.2024, leg. C. Makris.

Status: Non-native.

Status of establishment: Established.

Notes: Native to Asia, *C. ayyari* has been detected over the last decade from many European and Mediterranean countries, including neighbouring Israel (Novoselsky and Freidberg 2013), Greece (Rietschel 2015), Syria (Zeity

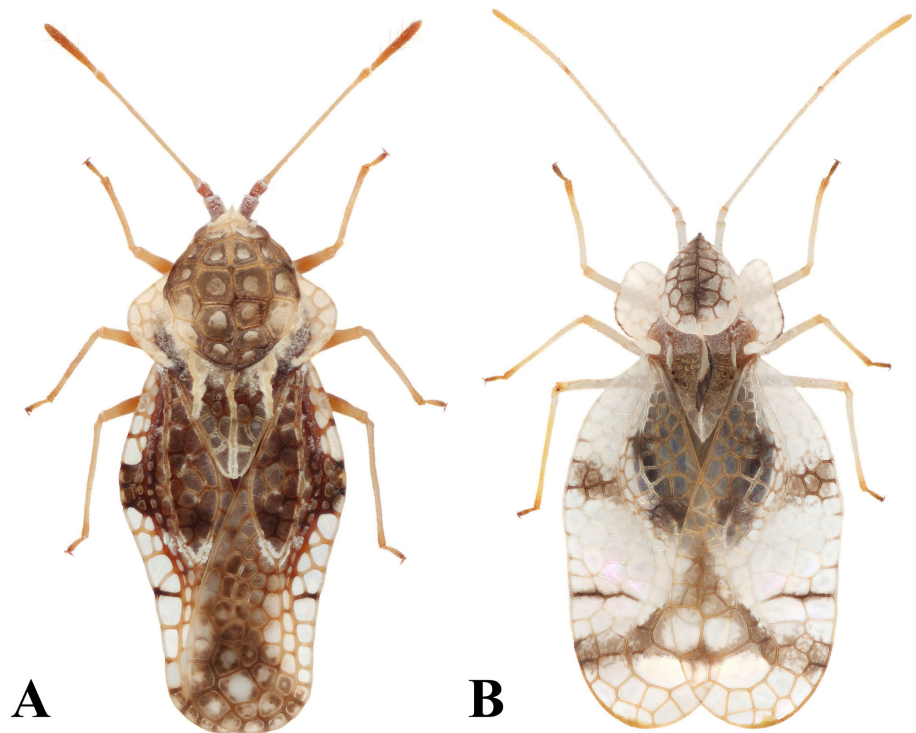


Figure 3. Photographs of *Corythauma ayyari* (A) and *Stephanitis lauri* (B) (Hemiptera: Tingidae). Photographed by Mr. C. Makris.

and Ali 2019), and Egypt (van der Heyden 2020). Specimens in Cyprus were collected from ornamental *Jasminum* sp., with the plants' leaves being discoloured and with yellow chlorotic spots. As such, these observed impacts may affect the aesthetic and commercial value of *Jasminum* spp., exacerbating the application of chemicals affecting non-target taxa.

***Stephanitis lauri* Rietschel, 2014 (Tingidae)**

(Figure 3B)

Material examined: LIMASSOL, Limassol, Ethnikis Antistaseos str., (34.681803°N, 33.038076°E), 12.ix.2025, leg. V. Koutsoukos, J. Demetriou.

Status: Data deficient.

Status of establishment: Unknown.

Notes: According to Abenaim et al. (2020), “The origin of *S. lauri* is very unclear, it is not certain whether it is an autochthonous species of Crete or an invasive insect accidentally introduced both into Crete and France. The hypothesis is that it could be a non-native species, accidentally introduced into Europe”. Up-to-date, the species has been recorded from Greece (Crete), France, Spain, Portugal, and Italy (Rietschel 2013, 2014; Streito et al. 2018; Abenaim et al. 2020; Riba-Flinch and Goula 2021; Cherpitel and Filipe 2024), with records from Cyprus widening the species' distribution in the Mediterranean. Although *Laurus nobilis* L. is native to the Mediterranean region, *S. lauri* might have been introduced to the area through some other ornamental Lauraceae. Nevertheless, further analyses including the use of molecular tools is necessary to decipher its native or non-native status. Based

on available data and evidence it should probably be listed as cryptogenic at the global level. Further research is needed but meanwhile we retain the species in the checklist of non-native insects on Cyprus as data deficient.

Dermaptera

***Euborellia annulipes* (Lucas, 1847) (Anisolabididae)**

Material examined: PAPHOS, Pegeia, banana cultivation (34.877287°N, 32.345103°E), 22 m alt., 18.xi.2024, leg. J. Demetriou & M. Hadjiconstantis.

Status: Cryptogenic.

Status of establishment: Established.

Notes: The status of *E. annulipes* in the Mediterranean requires further examination. Although initially classified as *alien within Europe* by Rasplus and Roques (2010), alongside the annotation “Mediterranean region? (Cosmopolitan)”, it is currently listed as cryptogenic in EASIN (2025). As research on the Dermaptera fauna of Cyprus has been scarce (Georghiou 1977; Haas and Henderickx 2002), *E. annulipes* is reported for the first time on the island despite its extended, global distribution. Examined specimens were identified based on the identification keys and remarks of Matzke and Kocarek (2015) for distinctions from *E. arcanum* and Kalaentzis et al. (2021) for their updated key of *Euborellia* spp. in Europe. The species is most probably widespread on the island as shown by citizen science records on iNaturalist (2025).

Diptera

***Horidiplosis ficifolii* (Harris, 2003) (Cecidomyiidae)**

Material examined: PAPHOS, Tombs of the Kings vic. (34.7757°N, 32.4089°E), 23 m alt., 30.vi.2024, leg. E. Koutsoukos and J. Demetriou.

Status: Non-native.

Status of establishment: Established.

Notes: Native to South-eastern Asia *H. ficifolii* was first described outside its native range in Europe, from specimens collected in the Netherlands, Denmark and the UK from infested plants of the ornamental fig, *Ficus benjamina* L., imported from Taiwan (Harris and de Goffau 2003). Since then, it has also been recorded from the Czech Republic (Beránek and Šafránková 2010). In Cyprus, yellow to dark-brown blisters and blotches were observed on large *F. microcarpa* L. trees planted in an abandoned apartment complex, although the fly does not seem to substantially affect the viability of its host plant.

***Phytoliriomyza jacarandae* Steyskal & Spencer, 1978 (Agromyzidae)**

Material examined: LIMASSOL, Limassol, Garili park, (34.690°N, 33.015°E), 30.iii.2024, leg. V. Koutsoukos & J. Demetriou, ex. *Jacaranda mimosifolia* leaves.

Status: Non-native.

Status of establishment: Established.

Notes: A cosmopolitan species originally native to South America, the native range of its host plant *Jacaranda mimosifolia* D.Don. The species has been detected within the Mediterranean Basin from Italy (Bella et al. 2007), Greece (Bella 2014) and Spain (Sánchez García 2015). In Cyprus we observed mines on leaves of *J. mimosifolia* resulting in chlorotic spots and leaf falling. Nevertheless, infestation signs were not observed to cause major drying of leaves, although heavy infestations may undermine the aesthetics of urban parks where the tree is planted.

Lepidoptera

***Megalorhipida leucodactylus* (Fabricius, 1794) (Pterophoridae)**

(Figure 1B)

Citizen science data: Cyprus, Iskele/Trikomo, Dipkarpaz/Rizokarpaso (35.6068°N, 34.3904°E), 07.ix.2024, obs. O. Alkan, det. O. Alkan & C. Gielis (<https://www.inaturalist.org/observations/240365222>).

Status: Non-native.

Status of establishment: Unknown.

Notes: *Megalorhipida leucodactylus* has a cosmopolitan distribution. Although it has been reported as cryptogenic in Lopez-Vaamonde et al. (2010), the species is currently listed as non-native to Europe in EASIN (2025), as such, it is treated as non-native to Cyprus. The species has been also recently reported from the island of Crete, while according to the authors no host plants have been reported from Europe (Fazekas and Edmunds 2013). No information on any adverse impacts is available.

Discussion

INNS are a major driver of global biodiversity loss with non-native insects affecting nature and people (Kenis and Branco 2010; Nentwig and Vaes-Petignat 2014; Cameron et al. 2016; IPBES 2023). Amongst their observed economic impacts, non-native insects affect ornamental plants and horticulture by reducing their economic value and undermining the “aesthetics of the urban landscape” (Kueffer and Kull 2017). Such a case has been observed for example in non-native species on ornamental *Ficus* spp., where *H. ficifolii* was responsible for chlorotic spots on *F. microcarpa*. Although, its impacts on the host plant could be negligible, the synergistic effect of multiple non-native insects on fig trees such as those of *Gynaikothrips* spp., *Singhiella simplex* (Singh, 1931), and *Trioza brevigenae* Mathur, 1973 further affect the economic and aesthetic value of ornamental fig trees causing leaf rolling, folding, and development of sooty mold (Collins and Philippou 2016; Compton et al. 2020; Demetriou and Koutsoukos *pers. obs.*). The detection of another non-native predator of *Gynaikothrips* spp., that of *M. indica*, in

addition to the already reported *Androthrips ramachandrai* Karny, 1926 (Collins and Philippou 2016), may offer partial biological control of their prey, reducing some of the adverse societal impacts of *Gynaikothrips* spp. (de Melo et al. 2013; Collins and Philippou 2016). This was not examined during our opportunistic surveys but would be worthy of future research. The presence of *M. indica* in Cyprus and Syria, where it was recently recorded (Yaseen Ali and Streito 2019), may indicate that this species reached these regions as a result of direct or indirect trade with India, perhaps through intermediate countries where the species has not yet been formally recorded. Conversely, it is possible that the species is not native in India, with its original distributional range remaining unknown.

Regarding the remaining detected non-native insects, the detection of *B. siliquastri* (Figure 2A) and *P. jacarandae* does not come as a surprise. Both pests are probably present in all regions where their host-plants *C. siliquastrum* and *J. mimosifolia* can be found, although still unreported. *Corythauma ayyari* (Figure 3A) was recorded from two ornamental jasmine plants from Paphos and Limassol districts. Despite *Jasminum* spp. being the insect's main host plant, *Althaea officinalis* L., *Eranthemum pulchellum* Andrews, *Hedychium* sp., *Lantana* sp., *Musa* sp., *Ocimum* sp., *Trachelospermum* sp. and *Volkameria inermis* L., have also been noted as suitable hosts (EPPO 2025b). Of the aforementioned, the ornamental non-native *Lantana camara* L. is widespread, while non-natives *Musa acuminata* Colla, *Musa × paradisiaca* L. and *Ocimum basilicum* L. are of economic importance to the island (Tsintides et al. 2002; Martinou et al. 2020). Taking into consideration that jasmine bushes (*J. grandiflorum* L. and *J. mesnyl* Hance) are common ornamental plants on the island (Tsintides et al. 2002), the dependence of *C. ayyari* on its host plants to spread (Durand and Guilbert 2024), and the possibility of other ornamental hosts acting as stepping stones for the species' spread, *C. ayyari* is expected to hold a wider distribution on the island. Furthermore, the presence of two native species of *Althaea* L. on Cyprus, i.e. *A. hirsuta* L. and *A. setosa* (Boiss.) Alef. (Hand et al. 2011), raises concerns that *C. ayyari* could potentially spread into natural habitats. Nevertheless, this hypothesis should be further investigated in the field and under laboratory conditions. Regarding the other lace bug, *S. lauri* (Figure 3B), this case should be further investigated through molecular tools to assess its native or non-native status in Cyprus and the Mediterranean. Similar approaches could be followed for the cryptogenic *E. annulipes*.

While the establishment status and subsequent spread of the coffee bean weevil *A. fasciculatus* (Figure 2B) and the spiderling plume moth *M. leucodactylus* (Figure 1B) may be of minor importance to native biodiversity and ecosystem function, the case of the harlequin ladybug *H. axyridis* necessitates further action. To-date, the species is speculated to be widespread in the northern part of the island (Prof. Ö. Özden pers.

communication). Nevertheless, its initial year of introduction, real and potential distribution, and impacts are currently unknown. Taking into consideration our limited knowledge of the island's Coccinellidae (Özden et al. 2006) as well as the adverse impacts of *H. axyridis* on native Coccinellidae observed around the globe, structured monitoring of ladybug populations and assessments of the harlequin ladybug's impacts are crucial.

The newly presented species are expected to hold established populations and a wider distribution on the island, given the common use of their host plants as ornamentals in both urban and rural parks and gardens (Tsintides et al. 2002) as well as their already wide distribution in Europe and the Mediterranean. Their potential integration into native ecosystems should be further investigated, including studies on native or introduced host plants, prey species, and parasitoid assemblages. In an era of continuous urban and touristic development on the island, stronger phytosanitary measures could hamper further introductions of non-native insects (Bacon et al. 2012; Hulme et al. 2018). Early detection of and rapid response to non-native insects associated with ornamental plants is crucial to limit further spread and mitigate impacts.

Lastly, based on the results of this study with the detection of both *H. axyridis* and *M. leudodactylus* (Figure 1A, B) by citizen scientists, public participation in the scientific research of biological invasions is pivotal in documenting the detection and spread of non-native species. In recent years, citizen scientists have unveiled the presence, distribution and impacts of numerous non-native insects on the island, including but not limited to, that of the rosemary beetle *Chrysolina americana* (Linnaeus, 1758) (Coleoptera: Chrysomelidae) (Hadjiconstantis and Zoumides 2021), the Asian tiger mosquito *Aedes albopictus* (Skuse, 1894) (Diptera: Culicidae) (Christou et al. 2023), true bugs *Tempyra biguttula* Stål, 1874 (Hemiptera: Rhyparochromidae) (van der Heyden 2023) and *Andrallus spinidens* (Fabricius, 1787) (Hemiptera: Pentatomidae) (van der Heyden and Lupoli 2024), as well as the lime butterfly *Papilio demoleus* Linnaeus, 1758 (Lepidoptera: Papilionidae) (John et al. 2021). As further introductions and spread of already established non-native insects is anticipated for the future, strengthening public participation in biodiversity recording is vital to enhance early warning and rapid response systems, real-time monitoring of the distribution of INNS, and measures of mitigation of their spread and impacts.

Author's contribution

Research conceptualization: JD, EK. Sample design and methodology: JD, EK. Investigation and data collection: JD, EK, LRD, CM, AB, GK. Data analysis and interpretation: JD, EK, LRD, CM, AB, GK, CG, HER, AFM. Funding provision: HER, AFM. Writing – original draft: JD, EK; Writing – review & editing: JD, EK, LRD, CM, AB, GK, CG, HER, AFM. JD and EK contributed equally sharing first authorship.

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