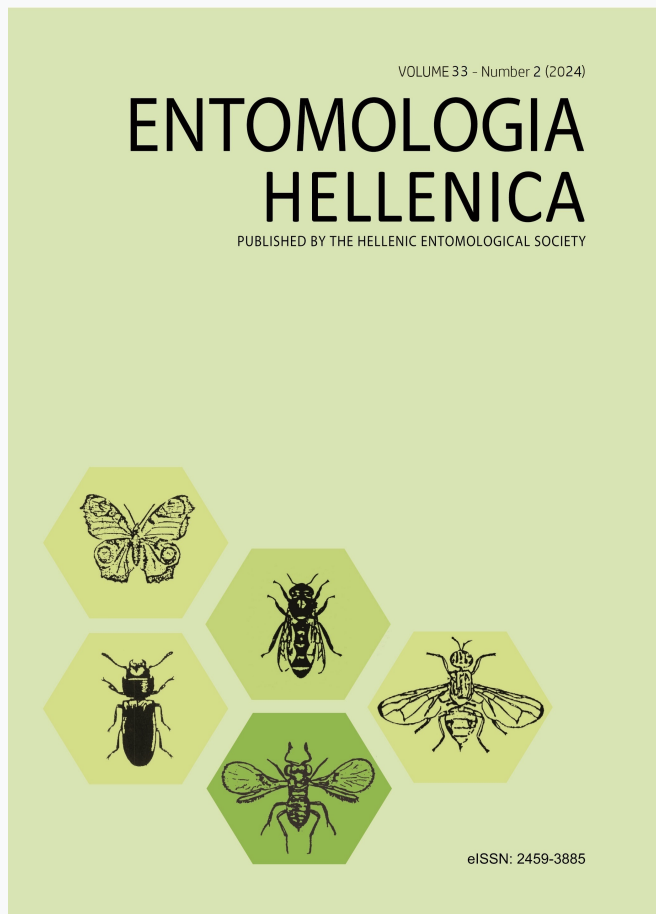


ENTOMOLOGIA HELLENICA

Vol 33, No 2 (2024)

Entomologia hellenica 33(2)



First record of the Zigzag elm sawfly *Aproceros leucopoda* (Hymenoptera: Argidae) in Greece

Angelos Tsikas, Paraskevi Karanikola

doi: [10.12681/eh.37849](https://doi.org/10.12681/eh.37849)

Copyright © 2024, Angelos Tsikas, Paraskevi Karanikola



This work is licensed under a [Creative Commons Attribution-NonCommercial-ShareAlike 4.0](https://creativecommons.org/licenses/by-nc-sa/4.0/).

To cite this article:

Tsikis, A., & Karanikola, P. (2024). First record of the Zigzag elm sawfly *Aproceros leucopoda* (Hymenoptera: Argidae) in Greece. *ENTOMOLOGIA HELLENICA*, 33(2), 70–77. <https://doi.org/10.12681/eh.37849>

First record of the Zigzag elm sawfly *Aproceros leucopoda* (Hymenoptera: Argidae) in Greece

ANGELOS TSIKAS* AND PARASKEVI KARANIKOLA

Department of Forestry and Management of the Environment and Natural Resources, Laboratory of Forest Protection and Environmental Pollution, Democritus University of Thrace, School of Agricultural and Forestry Sciences, Ath. Pantazidou 193, 68 200, Orestiada, Greece

ABSTRACT

The Zigzag elm sawfly *Aproceros leucopoda* Takeuchi, 1939 (Hymenoptera, Argidae) is a defoliator of elm trees of Asian origin recently introduced into Europe. In this publication, *A. leucopoda* is recorded in Greece from Xanthi, constituting the first record of this alien species to the country. The presented locality is the southernmost point of its hitherto known distribution in Europe.

KEY WORDS: Alien species, Zigzag elm sawfly, defoliator pests, first record, *Ulmus* spp., Thrace.

Introduction

Introduction and spread of alien species during the last centuries have been facilitated by globalization and international trade, posing a significant worldwide threat to biodiversity and economy (Hulme 2009). Insects, being the most numerous terrestrial animal class (Stork 2018), have many species that spread outside their natural range. Not surprisingly, the total estimated number of alien insects is as high as a quarter of species (Liebhold et al. 2018). Some of these species can pose serious threats to various natural ecosystems, endangering the existence of many species, as well as the smooth functioning of ecosystems (Roques 2010; Smith et al. 2018; Olenici et al. 2022). In Greece, a total of 469 alien insect species have been identified (Demetriou et al. 2021).

Aproceros leucopoda Takeuchi, 1939 is a defoliator of elm trees (*Ulmus* spp.) of Asian origin, naturally occurring in East Asia – Japan (Takeuchi 1939; Naito 2004), China (Wu and Xin, 2006) and Russian Far

East (Zhelochovtsev and Zinovjev 1995), introduced into Europe (probably in the early 2000) and North America (EPPO 2024). It is a thelytokous parthenogenetic species, and no males have ever been recorded. Females lay 7–60 eggs into the tips of consecutive indentations around the edges of leaves. Larvae hatch after 4–8 days, feeding exclusively on elms (Wu 2006; Blank et al., 2010; Yu et al. 2011; Martynov and Nikulina 2017). Feeding traces of early-stage larvae have a characteristic zigzag pattern. Later, the attacked leaf is completely consumed except for the thick middle vein. There are six larval instars, and development is completed within 9–18 days (Papp et al. 2018). Larvae make either a loosely spun cocoon with a net-like structure fixed to the lower surface of leaves, rarely on twigs or the ground, or a more compact, solid-walled cocoon with a grid of silk strands, found in the litter or soil in the field from at least as early as June (Wu 2006; Blank et al. 2010; Martynov and Nikulina, 2017). Pupation in the loosely spun cocoons occurs after 2–3 days, and adults emerge 4–7 days after. The

*Corresponding authors: atsikas@fmenr.duth.gr

total period from oviposition to adult emergence takes 19–36 days (Wu 2006, Blank et al. 2010, Mol and Vonk 2015, Martynov and Nikulina 2017).

In this paper, the species *A. leucopoda* is recorded from Xanthi (Thrace) constituting the first record of this alien species in Greece.

Materials and Methods

On 13 May 2024, during ordinary hand-collecting samplings in a forest stand dominated by oaks near Mega Eumoiro, Xanthi [41.206°N, 24.799°E, alt. 305 m], we accidentally met a field elm (*Ulmus minor* Mill.) with the characteristic zigzag-shaped damage on a leaf (Blank et al. 2010; Doychev 2015; Martynov and Nikulina 2017) (Figure 1). By closer investigation, we

located a larva feeding on the leaf. We sampled the leaf with the specimen and took it to the Laboratory of Forest Protection and Environmental Pollution for further investigation. The specimen was placed in a glass vial and preserved in 75% EtOH.

For the identification of *A. leucopoda*, the key of Blank et al. (2010) has been used, which includes detailed descriptions of larvae, adults and the characteristic damage caused by the feeding larvae on elm leaves. The images of the specimen included in this paper were taken using Nikon D90 camera and Olympus SZX7 stereomicroscope at magnifications between 80-140x, with a cold-light source equipped with two flexible cold light arms covered with a light diffuser, and a LED ring mounted on the stereomicroscope focus.



FIG. 1: Larva of *Aproceros leucopoda* Takeuchi, 1939 feeding on an elm leaf.

Results and Discussion

The larva was identified as *Aproceros leucopoda*. The diagnostic character used

for distinguishing *A. leucopoda* from other Argidae species was the characteristic dark brown T-shaped marks on the 2nd and 3rd pair of thoracic legs (Figure 2).



FIG 2. *Aproceros leucopoda* larva.

This is the first reported occurrence of the zigzag elm sawfly in Greece, which comprises the first alien species of the family Argidae in the country. The species has been first recorded in Europe in 2003 from Hungary and Poland (Blank et al. 2010). Romania in 2005, Ukraine in 2006, Slovakia in 2007 (Blank et al. 2010), Moldova in 2008 (Timuş et al. 2008, misidentified as *Arge* sp.), Austria and Italy in 2009 (Zandiacomo et al. 2011), in Germany, the European part of Russia, Slovenia, Croatia the Czech Republic in 2011 (Kraus et al. 2011; Artokhin et al. 2012; De Groot et al. 2012; Matošević 2012; Jurásková et al. 2014), Serbia in 2012 (Glavendekić et al. 2013), in Belgium and the Netherlands in 2013 (Boevé, 2013; Mol and Vonk, 2015), in Bulgaria and Latvia in 2015 (Doychev 2015; Mihailova 2015), in France, Estonia, Bosnia and Herzegovina, the United Kingdom and Switzerland in 2017 (Legrand 2017; NPPO of Estonia

2017; Dautbašić et al. 2018; Forest Research 2018; Hölling 2018), in Luxembourg in 2018 (Burton et al. 2019) and in Lithuania in 2020 (Sinchuk et al. 2021) (Figure 3). In 2020, it was also documented occurring in North America (Martel et al. 2022). The presented locality is the southernmost point of hitherto known *A. leucopoda* distribution in Europe, but it is expected to be more widespread in Greece and spread over a significant part of the territory, due to the high occurrence of elms in green stands. The entrance route of *A. leucopoda* could have been the neighboring country of Bulgaria, where it has been first recorded in 2015, as a stowaway or spontaneous spread (Doychev 2015). Undoubtedly, its actual year of introduction may be much earlier. Low population levels along with insignificant damage to the hosts made its presence unnoticed so far.

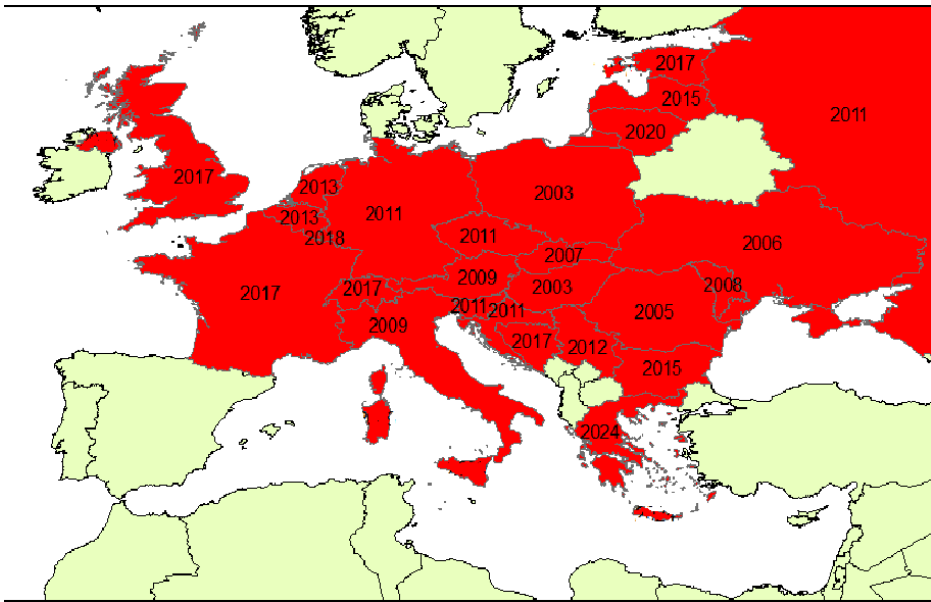


FIG. 3: Known distribution of *Aproceros leucopoda* Takeuchi, 1939 in Europe. Countries where the species has been previously reported are shaded red with the year of the first recording.

Considering the widespread presence of elms and the rapid reproduction enhanced by parthenogenesis (Blank et al. 2010), it is possible that *A. leucopoda* could quickly increase its abundance and distribution and dramatically increase the decline of elms already suffering from Dutch elm disease transmitted by bark beetles (*Scolytus* spp.) (Webber 1990) and elm yellows transmitted by leafhoppers (Pavan 2000; Carraro et al. 2004). Therefore, further research is needed for the actual and potential distribution of this species and its effects on the health of elm trees.

References

- Artokhin, K. S., Ignatova, P. K. and Terskov, E. N. (2012). New insects including invasive species for the fauna of Rostov Region (Russia). *Caucasian Entomological Bulletin* 8: 199-202 (In Russian, English abstract).
- Blank, S. M., Hara, H., Mikulás, J., Csóka, G., Ciornei, C., Constantineanu, R., Roller, L., Altenhofer, E., Huflejt, T. and Véték, G. (2010). *Aproceros leucopoda* (Hymenoptera: Argidae): An East Asian pest of elms (*Ulmus* spp.) invading Europe. *European Journal of Entomology* 107(3): 357-367.
<https://doi.org/10.14411/eje.2010.045>
- Boevé, J. L. (2013). First record in Belgium of the invasive sawfly *Aproceros leucopoda* (Hymenoptera: Argidae) and some related ecological data. *Bulletin de la Société royale belge d'Entomologie / Bulletin van de Koninklijke Belgische Vereniging voor Entomologie* 149: 217-221.
- Burton L., Weiss, J. and Schneider, N. (2019). Premiers signalements de cinq espèces de symphytes (Hymenoptera, Symphyta) au Luxembourg: *Aproceros leucopoda* Takeuchi, 1939, *Neurotoma saltuum* (L., 1758),

- Craesus latipes* (Villaret, 1832), *Periclista pubescens* (Zaddach, 1859) et *Pristiphora geniculata* (Hartig, 1840). Bulletin de la Société des naturalistes luxembourgeois 121: 185-188.
- Carraro, L., Ferrini F., Ermacora, P., Loi, N., Martini M. and Osler, R. (2004). *Macropsis mendax* as a vector of elm yellows phytoplasma of *Ulmus* species. Plant Pathology 53(1): 90-95. <https://doi.org/10.1111/j.1365-3059.2004.00940.x>
- De Groot, M., Hauptman, T. and Seljak, G. (2012). - Prva najdba invazivne brestove grizlice, *Aproceros leucopoda* (Hymenoptera: Argidae) v Sloveniji [The first record of the invasive 'zigzag' sawfly, *Aproceros leucopoda* (Hymenoptera: Argidae) in Slovenia]. Gozdarski vestnik, 70(1): 3-7.
- Demetriou, J., Kalaentzis, K., Kazilas, C., Koutsoukos, E., Avtzis, D.N. and Georgiadis, C. (2021). Revisiting the nonnative insect fauna of Greece: Current trends and an updated checklist. NeoBiota 65: 93-108. <https://doi.org/10.3897/neobiota.65.64686>
- Dautbašić, M., Mujezinović, O., Zahirović, K. and Margaletić, J. (2018). Prvi nalaz brijestove ose listarice (*Aproceros leucopoda*) u Bosni i Hercegovini [First record of elm sawfly (*Aproceros leucopoda*) in Bosnia and Herzegovina]. Šumarski List 142(5-6): 283-285.
- Doychev, D. 2015. First record of the invasive elm sawfly *Aproceros leucopoda* Takeuchi (Hymenoptera: Argidae) in Bulgaria. Silva Balcanica 16 (1): 108–112.
- EPPO (2024). *Aproceros leucopoda*. Available from <https://gd.eppo.int/taxon/APRCLE> (Accessed May 14, 2024).
- Forest Research (2018). Elm Zigzag Sawfly <https://www.forestresearch.gov.uk/tools-and-resources/pest-and-disease-resources/elm-zigzag-sawfly/> (Accessed May 14, 2024).
- Glavendekić, M., Petrović, J. and Petaković, M. (2013). Alien invasive species *Aproceros leucopoda* Takeuchi (Hymenoptera: Argidae) – Elm pest in Serbia. Šumarstvo 1-2: 57-66 (In Serbian, English abstract).
- Hölling, D. (2018). *Aproceros leucopoda* Takeuchi, 1939 – Erstbeobachtung der Zickzack-Ulmenblattwespe in der Schweiz (Hymenoptera: Argidae). Entomo Helvetica 11: 149-152.
- Hulme, P. E. (2009). Trade, transport and trouble: managing invasive species pathways in an era of globalization. Journal of Applied Ecology 46: 10–18.
- Jurásková, M., Hradil, K. and Macek, J. (2014). Pilatenka *Aproceros leucopoda* –novsinvaznejkídce vuestC republice [The sawfly *Aproceros leucopoda* –new invasive pest in the Czech Republic]. Rostlinolékar 3: 21–23.
- Kraus, M., Liston, A. D. and Taeger, A., (2011). Die invasive Zick-Zack-Ulmenblattwespe *Aproceros leucopoda* Takeuchi, 1939 (Hym., Argidae) in Deutschland [The invasive zig-zag elm sawfly, *Aproceros leucopoda* (Hymenoptera: Argidae) in Germany]. DGaE Nachrichten 25(3): 117-119.
- Legrand, T. (2017). Nouvelle espèce invasive pour a France, La Tenthrède zigzag de l'Orme *Aproceros leucopoda* Takeuchi, 1939 (Hymenoptera, Tenthredinoidea, Argidae). Bulletin de la Société

- Entomologique du Nord de la France 365(4): 10-12.
- Liebhold, A.M., Yamanaka, T., Roques, A., Augustin, S., Chown, S.L., Brockerhoff, E.G. and Pyšek, P. (2018). Plant diversity drives global patterns of insect invasions. *Scientific Reports* 8(1): 12095. <https://doi.org/10.1038/s41598-018-30605-4>
- Martel, V., Morin, O., Monckton, S., Eiseman, C., Béliveau, C., Cusson, M. and Blank, S. (2022). Elm zigzag sawfly, *Aproceros leucopoda* (Hymenoptera: Argidae), recorded for the first time in North America through community science. *Canadian Entomologist* 154:E1. <https://doi.org/10.4039/tce.2021.44>
- Martynov, V. V. and Nikulina, T. V. (2017). Population surge of zigzag elm sawfly (*Aproceros leucopoda* (Takeuchi, 1939): Hymenoptera: Argidae) in the northern Cis-Azov region. *Russian Journal of Biological Invasions* 8: 135-142. <https://doi.org/10.1134/S2075111717020059>
- Matošević, D. (2012). Prvi nalaz brijestove ose listarice (*Aproceros leucopoda*), nove invazivne vrste u Hrvatskoj [First record of Elm Sawfly (*Aproceros leucopoda*), new Invasive Species in Croatia]. *Šumarski list*, 136 (1-2), 61-61.
- Mihailova, J. (2015). *Aproceros leucopoda* - jauns gobu kaitēklis Latvijā. <http://www.vaad.gov.lv/21/section.aspx/6937> (accessed on 14.05.2024)
- Mol, A. W. M. and Vonk, D. H. (2013). De iepenzigzagbladwesp *Aproceros leucopoda* (Hymenoptera, Argidae), een invasieve exoot in Nederland [The 'ziczac' elm sawfly *Aproceros leucopoda* (Hymenoptera, Argidae), an invasive species in the Netherlands]. *Entomologische Berichten* 75 (2): 50-63.
- Naito, T. (Ed.). (2004). Species Diversity of Sawflies in Hyogo Prefecture, Central Japan. Monograph of Nature and Human Activities 1. Hyogo, 85 + 10 pls.
- NPPO of Estonia (2017). First report of *Aproceros leucopoda* in Estonia. EPPO Reporting Service 10: 2017/187.
- Olenici, N., Balacenoiu, F., Tomescu, R., Nețoiu, C., Buzatu, A. and Alexandru, A. (2022). Invasive alien forest insect species in South-Eastern Romania. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca* 50(1): 12618.
- Oten, K. L. F., Day, E., Dellinger, T., Disque, H. H., Barringer, L. E., Cancelliere, J., Somers, L. and Bertone, M. A. (2023). First records of elm zigzag sawfly (Hymenoptera: Argidae) in the United States, *Journal of Integrated Pest Management* 14(1): 12. <https://doi.org/10.1093/jipm/pmad009>
- Papp, V., Ladányi, M. and Véték, G. (2018). Temperature-dependent development of *Aproceros leucopoda* (Hymenoptera: Argidae), an invasive pest of elms in Europe. *Journal of Applied Entomology* 142: 589–597. <https://doi.org/10.1111/jen.12503>
- Pavan, F. (2000). Occurrence on elm and phenology of Auchenorrhyncha potential vectors of the phytoplasma associated with elm yellows disease. *Bollettino di Zoologia agraria e di Bachicoltura* 32(2): 59-68.
- Roques, A. (2010) Taxonomy, time and geographic patterns. In: Roques, A., Kenis, M., Lees, D., Lopez-Vaamonde, C., Rabitsch, W., Rasplus, J.Y. and Roy, D. (Eds.) *Alien*

- terrestrial arthropods of Europe, 4th edition. *BioRisk* 4(2). Sofia: Pensoft Publishers pp. 11–26.
- Sinchuk, A., Vaicekauskaitė, K. and Sinchuk, N. (2021). First record of *Aproceros leucopoda* Takeuchi, 1939 (Hymenoptera: Argidae) in Lithuania. *Bulletin of the Lithuanian Entomological Society* 5(33): 111–113.
- Smith, R.M., Baker, R.H.A., Collins, D.W., Korycinska, A., Malumphy, C.P., Ostoj-Starzewski, J.C., Prior, T., Pye, D. and Reid, S. (2018) Recent trends in non-native, invertebrate, plant pest establishments in Great Britain, accounting for time lags in reporting. *Agricultural and Forest Entomology* 20(4): 496–504. <https://doi.org/10.1111/j.1461-9563.2007.00349.x>
- Stork, N.E. (2018). How many species of insects and other terrestrial arthropods are there on earth? *Annual Review of Entomology* 63: 31–45. <https://doi.org/10.1146/annurev-ento-020117-043348>
- Takeuchi, K. (1939). A systematic study on the suborder Symphyta (Hymenoptera) of the Japanese Empire (II). *Tenthredo* 2: 393–439.
- Timuş, A., Derjanschi, V. and Croitoru, N. (2008). *Viespea neagră* a ulmului (*Arge* sp.) în Republica Moldova și dezvoltarea acesteia pe ulmul de câmp – *Ulmus minor*. *Mediul Ambient* 4: 35–37.
- Vétek, G., Csávás, K., Fail, J. and Ladányi, M. (2022). Host plant range of *Aproceros leucopoda* limited within Ulmaceae. *Agricultural and Forest Entomology* 24: 1–7. <https://doi.org/10.1111/afe.12463>
- Webber, F. J. (1990). Relative effectiveness of *Scolytus scolytus*, *S. multistriatus* and *S. kirschi* as vectors of Dutch elm disease. *European Journal of Forest Pathology*, 20(3): 184–192. <https://doi.org/10.1111/j.1439-0329.1990.tb01129.x>
- Wu, X. Y. (2006). Studies on the biology and control of *Aproceros leucopoda*. *Plant Protection*, 32: 98–100. (in Chinese)
- Wu, X. Y. and Xin, H. (2006). A new record of the genus *Aproceros* Malaise (Hymenoptera: Argidae) from China. *Entomotaxonomia* 28 (4): 279–280.
- Yu, G. Y., Zhang, Z. H. and Wang, H. (2011). Identification and bionomics of the sawfly *Aproceros leucopoda*. *Chinese Journal of Applied Entomology*, 48: 664–668. (in Chinese, English abstract).
- Zhelochovtsev, A., and Zinovjev, Z. (1995). A list of the sawflies and horn-tails (Hymenoptera, Symphyta) of the fauna of Russia and adjacent territories. *Entomological Review* 74: 395–415 (In Russian).

Πρώτη καταγραφή του *Aproceros leucopoda* (Hymenoptera: Argidae) στην Ελλάδα

ΑΓΓΕΛΟΣ ΤΣΙΚΑΣ* ΚΑΙ ΠΑΡΑΣΚΕΥΗ ΚΑΡΑΝΙΚΟΛΑ

Τμήμα Δασολογίας και Διαχείρισης Περιβάλλοντος και Φυσικών Πόρων, Εργαστήριο Υλωρικής και Ρύπανσης Περιβάλλοντος, Δημοκρίτειο Πανεπιστήμιο Θράκης, Σχολή Επιστημών Γεωπονίας και Δασολογίας, Αθ. Πανταζίδου 193, 68 200, Ορεστιάδα, Ελλάδα

ΠΕΡΙΛΗΨΗ

Το *Aproceros leucopoda* Takeuchi, 1939 (Hymenoptera, Argidae) είναι φυλλοφάγο έντομο της φτελιάς ασιατικής προέλευσης που εισήχθη πρόσφατα στην Ευρώπη. Σε αυτή την εργασία, το *A. leucopoda* καταγράφεται για την Ελλάδα στην περιοχή της Ξάνθης, αποτελώντας την πρώτη αναφορά του ξενικού αυτού είδους για τη χώρα. Η θέση καταγραφής του είναι το νοτιότερο σημείο της μέχρι τώρα γνωστής εξάπλωσής του στην Ευρώπη.