



## SHORT NOTE

### Outdoor Occurrence of the Introduced Yellow-footed Ant *Nylanderia flavipes* (Smith, 1874) in Switzerland (Hymenoptera: Formicidae)

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#### Abstract

We report the first European outdoor record for the exotic ant *Nylanderia flavipes* (Smith, 1874), discovered in Switzerland. A worker was collected by hand and another in a pitfall trap outdoors during an inventory of the botanical garden on the larger Brissago Island (Isola di San Pancrazio) in 2023. The morphological identification was confirmed by DNA barcoding. *Nylanderia flavipes* is native to China, Japan, and Korea and is known to be introduced in North America. The species was most likely introduced with exotic plant imports. DNA-barcoding suggests a close relationship to *N. flavipes* sequences from China (Fujian and Shaanxi provinces). We recommend monitoring the potential impact and spread of this species in Switzerland and neighboring Italy.

#### Introduction

The number of established neozoa has steadily increased for the past few decades. Although mainly in the tropics (Wetterer, 2015), introduced ants (Hymenoptera: Formicidae) are increasingly colonizing temperate and submediterranean regions, including invasive pest species (e.g., Seifert 2020). The Brissago Islands are located in Lake Maggiore, just over 1 km off the coast of the mainland of Brissago. They host a botanical garden on San Pancrazio Island and a greenhouse on Sant'Apollinare Island, belonging to the Canton of Ticino. The botanical garden consists of plants from the Mediterranean and subtropical climatic regions (Cape region of South Africa, Californian coast, south-eastern coasts of Australia, and central Chile) and their reconstructed environments. The ant fauna of the Brissago Islands is quite well known: several myrmecological studies were carried out on both islands during the last almost 40 years (Della Santa, 1988;

Pronini, 1989; Marazzi et al., 2014; Schär et al., 2023; Mattei-Roesli et al., 2025), and led to the discovery of around 50 ant species in total. During a new inventory of the ant fauna (Mattei-Roesli et al., 2025) and other faunistic groups on both Brissago Islands in 2023, some workers of *Nylanderia flavipes* were found in the botanical garden (San Pancrazio Island). *Nylanderia flavipes* is native to China, Japan, and Korea and known as an introduced species in the United States and Eurasia, where it was established indoors in the United Kingdom, the Netherlands and Germany and outdoors in Georgia, Iran, and southern Russia, according to AntMaps.org (Janicki et al., 2016; Guénard et al., 2017). In invaded areas in the United States, it appears to blend into the ant community, but with purportedly negative impact on ecologically similar ant species in terms of nesting sites and colony size (Wetterer, 2011). However, the species is not regarded as infesting or a pest species and its impact is thought to be minimal (Williams & Lucky, 2020).



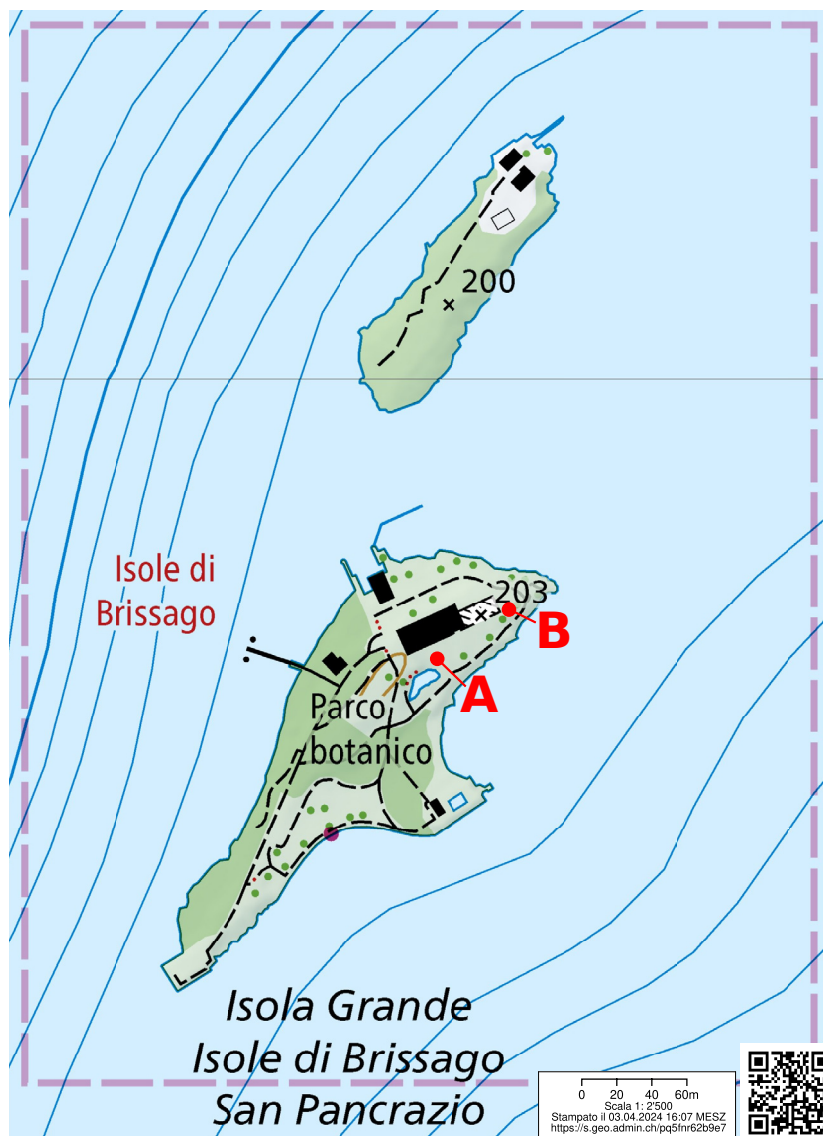
## Methods

Ants were collected on San Pancrazio and Sant' Apollinare Islands at 200 m a.s.l. on Maggiore Lake in the Canton of Ticino, Southern Switzerland. Hand collection, pitfall traps, and window traps were used to collect ants between March 22 and September 9, 2023. The geographic origin of the *Nylanderia* sample found in the botanical garden of San Pancrazio was unknown. Therefore, taxonomic literature for the genus *Nylanderia* for different zoogeographic regions was used for identification and DNA barcoding. The voucher was compared to known introduced *Nylanderia* species, *Nylanderia* from the Nearctic and Afrotropical biogeographic regions, from India and the West Indies using the following literature: LaPolla et al., 2011, Kallal & LaPolla, 2012, LaPolla & Kallal, 2019, Williams & Lucky, 2020. Morphometric measurements were obtained following the definitions of Kallal & LaPolla 2012. We further verified the identification by comparing our specimen with the images of the *Nylanderia flavipes* lectotype available on AntWeb (AntWeb, 2024).

DNA barcoding was performed by Sinsoma GmbH (Völs, Austria). DNA was extracted using an automatic platform (Biosprint 96©, Qiagen) and the Qiagen DNA Blood & Tissue Kit in a sterile lab. The primer pair LCO1419 and HCO2198 (Folmer et al., 1994) was used, yielding 658 bp of the barcode region of the COI gene. The resulting chromatograms were edited in UGENE 48.0 (Okonechnikov et al., 2012). The resulting COI sequence was compared to sequences on BOLD (Ratnasingham & Hebert, 2007). A tree-based identification request to the species level database was performed on March 25, 2024.

## Results

Two workers of *Nylanderia flavipes* were found in the botanical garden, around Villa Emden (Figure 1). A single foraging worker was collected by hand in an anthropogenic habitat on a gravel path surrounded by Mediterranean and exotic plants (Figure 2a) (46.13263°N, 8.73578°E, 199 m) on August 18, 2023. The second worker was collected in a pitfall



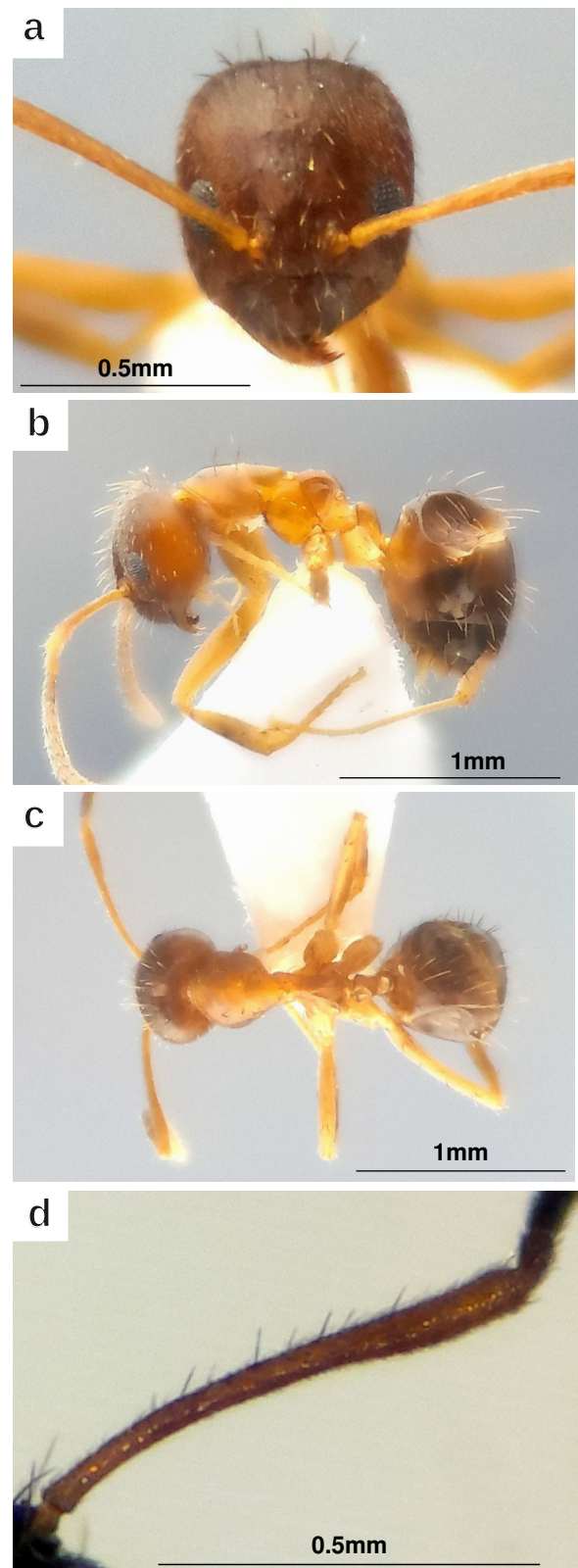
**Fig 1.** Area (San Pancrazio Island – map © swisstopo) where *Nylanderia flavipes* workers were sampled in 2023 around Villa Emden; A: gravel path surrounded by vegetation (hand collection); B: Mediterranean area of the botanical garden (pitfall trap).

trap located in a reconstructed Mediterranean environment (Figure 2b, 2c) located at 46.13286°N, 8.73633°E, 199 m, where it remained in the field for 16 days in September (04.09.2023 – 20.09.2023). The samples were identified as *N. flavipes* by morphology. Workers of this species are characterized within *Nylanderia* by the following combination of morphological traits: 1. small body size (TL ca. 2 mm, Figure 3b); 2. antennal scapes with fewer than ten erect setae

(cf. *N. jaegerskioeldi*) (Figure 3d); 3. dorsal head covered by relatively dense pubescence hairs (cf. *N. vividula*) (Figure 3a); 4. mesonotum without pubescence (Figure 3b, 3c); 5. color yellowish, with the pigmentation of the first tergite often lighter than the following dark brown tergites (Figure 3b, 3c).



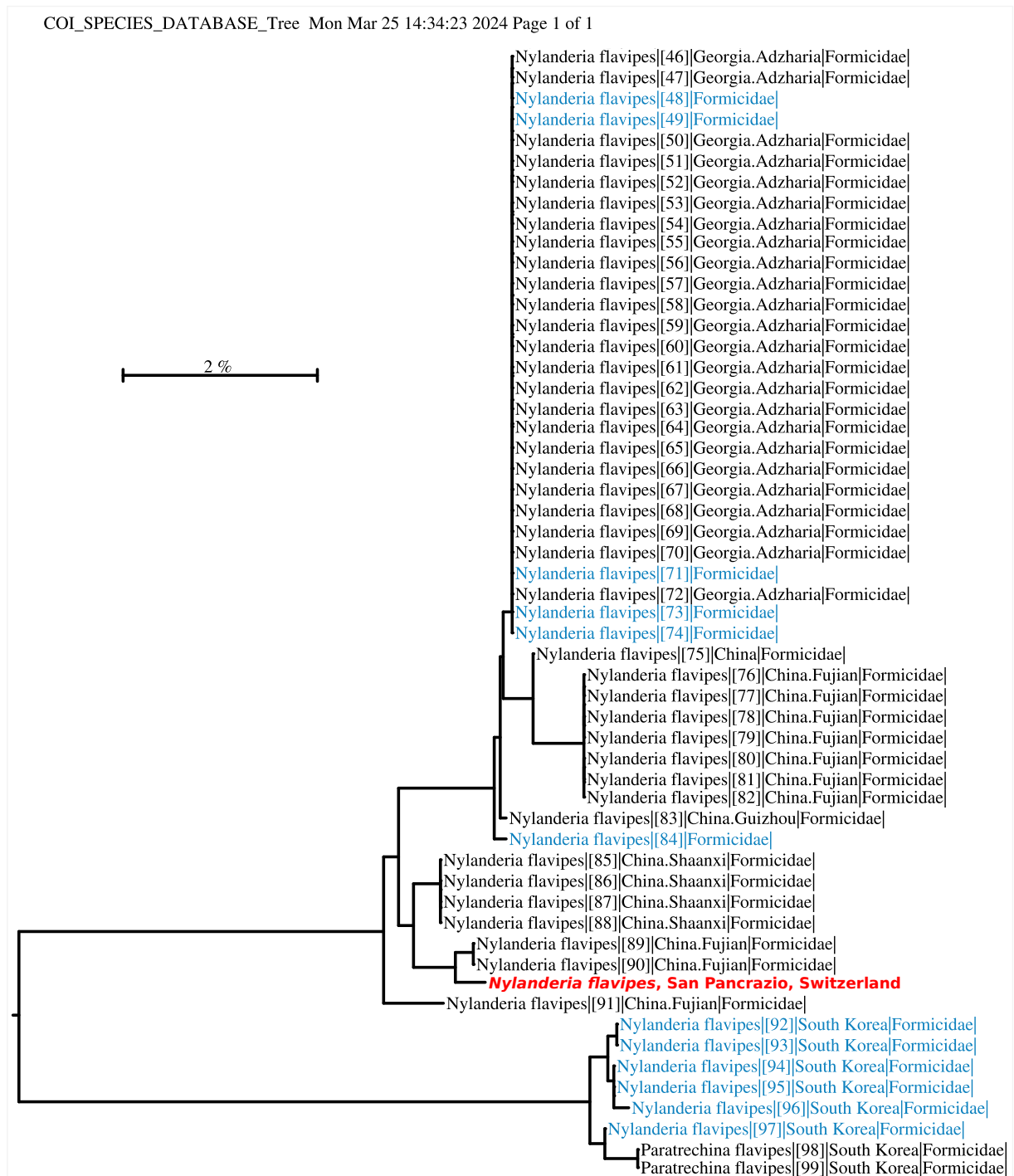
**Fig 2.** Habitat where *Nylanderia flavipes* workers were sampled on San Pancrazio Island: path around Villa Emden (a), Mediterranean area of botanical garden (b), and pitfall trap (c). Pictures: I. Forini-Giacalone.



**Fig 3.** Full face view (a), lateral view (b), dorsal view (c), and antennal scape (d) of a specimen of *Nylanderia flavipes* collected in 2023 on San Pancrazio Island, Switzerland. Pictures: S. Schär.

All except the last character are expressed in the investigated specimen from Switzerland (Figure 3). The first tergite of this specimen is as dark as the remaining ones, but this trait seems variable within *N. flavipes* (Kallal & LaPolla, 2012). Measurements in mm (n = 2): TL: 2.30, 2.53; HW: 0.51, 0.57; HL: 0.61, 0.64; EL: 0.13, 0.14; SL: 0.69, 0.72; PW: 0.37, 0.42; WL: 0.78, 0.79; GL: 0.90, 1.10; PDH: 0.25, 0.27; PFL: 0.56, 0.52; PFW: 0.15, 0.14. SMC: 8, 7; PMC: 2, 3; MMC: 0, 3. Indices: CI: 84, 81; REL: 21–23; SI: 133, 126; FI: 26, 27. A complete DNA barcode of 658 bp length and high quality

could be retrieved (GenBank accession no.: OZ199222). The identification request of the DNA barcode on BOLD retrieved a 99.53% match to two sequences of *N. flavipes* specimens from Fujian, China. The sequence of interest was nested within a clade of 54 specimens, all (100%) identified as *N. flavipes* (Figure 4). The seven nearest related sequences were all from specimens collected in China (Fujian and Shaanxi provinces), while other specimens from the same clade were also from China, Georgia (country), and South Korea. The two workers described here are deposited at the Museo Cantonale di Storia Naturale (MCSN) in Lugano.



**Fig 4.** Dendrogram (n = 55) resulting from a BOLD tree-based identification request on March 25, 2024, for the DNA barcode of a specimen of *Nylanderia flavipes* collected on San Pancrazio Island, Switzerland. The specimen of interest is labeled in red as “*Nylanderia flavipes*, San Pancrazio, Switzerland”.

## Discussion

To our knowledge, this is the first outdoor report of *Nylanderia flavipes* in Europe. According to Wetterer (2011), the species has been reported from England by Donisthorpe (1908) and from Germany by Eichler (1952), but only indoors. *Nylanderia flavipes* was also found in the Netherlands in 1980 but has only established a temporary population found during an import inspection there (Boer & Vierbergen, 2008). The low number of workers observed may indicate that *N. flavipes* has been relatively recently introduced to the Brissago Islands. However, further research should be done to understand its distribution on the islands and the mainland. *Nylanderia flavipes* was most likely introduced by plant imports to the botanical garden. A strong link between historical plant introductions and current insect invasions has recently been shown (Bonnamour et al., 2023) and botanical gardens have been documented as a site for introducing non-native ants before (e.g., Sheard et al., 2020). Even if currently not considered an invasive species (Wetterer, 2011), it has the potential to spread; therefore, the botanical garden staff and Canton Ticino authorities have been informed about the presence of this exotic ant. The species has rapidly spread in North America after its first encounter in 1939 (Wetterer, 2011). *Nylanderia flavipes* sexuals are mating outside the nest during nuptial flights in the United States (S. Schär, personal observation). They thus may disperse from the Brissago Islands to the mainland on their own. Additionally, many tourists visit the botanical garden every year, and the risk of unintended dispersion of this exotic species cannot be excluded. In order to minimize the risk of a potentially negative impact, we recommend that the population of these ants should be monitored and their further spread contained as much as possible.

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## Authors' Contributions

IF: Conceptualization, investigation, data curation, writing-original draft, writing-review & editing, visualization, funding acquisition.

RN: Conceptualization, investigation, data curation, writing-original draft, writing-review & editing.

SS: Conceptualization, investigation, data curation, writing-original draft, writing-review & editing, visualization.

## References

- AntWeb (2024). Version 8.111.2. California Academy of Sciences. Specimen: CASENT0903130 *Nylanderia flavipes*. <https://www.antweb.org/bigPicture.do?name=casent0903130&shot=h&number=1>. [Accessed on: 2024-10-11]
- Boer, P. & Vierbergen, B. (2008). Exotic ants in the Netherlands (Hym.: Formicidae). *Entomologische Berichten*, 68: 121-129.
- Bonnamour, A., Blake, R.E., Liebhold, A.M., Nahrung, H.F., Roques, A., Turner, R.M., Yamanaka, T. & Bertelsmeier, C. (2023). Historical plant introductions predict current insect invasions. *Proceedings of the National Academy of Sciences USA*, 120: e2221826120
- Della Santa, E. (1988). *Stenammina petiolatum* Emery (Hymenoptera: Formicidae) en Suisse. *Bulletin de la Société Entomologique Suisse*, 61: 361-364.
- Donisthorpe, H.S.J.K. (1908). Additions to the wild fauna and flora of the Royal Botanic Gardens, Kew: VII. I. Fauna. Hymenoptera. Formicidae (ants). *Bulletin of Miscellaneous Information (Royal Botanic Gardens, Kew)*, 1908: 121-122.
- Eichler, W.D. (1952). *Die Tierwelt der Gewächshäuser*. Geest & Portig, Leipzig. 93 pp.
- Folmer, O., Black, M., Hoeh, W., Lutz, R. & Vrijenhoek, R. (1994). DNA primers for amplification of mitochondrial cytochrome c oxidase subunit I from diverse metazoan invertebrates. *Molecular Marine Biology and Biotechnology*, 3: 294-299.
- Mattei-Roesli, M., Candolfi, I., Funk-Neumeyer, M., Forini-Giacalone, I., Lardelli, R., Maddalena, T., Milano, F., Neumeyer, R., Pagano, L. & Zanini, M. (2025). La fauna delle Isole di Brissago (Canton Ticino, Svizzera). *Memorie della Società Ticinese di Scienze Naturali*, 14: 181-194.
- Guénard, B., Weiser, M.D., Gomez, K., Narula, N. & Economo, E.P. (2017). The Global Ant Biodiversity Informatics (GABI) database: synthesizing data on the geographic distribution of ant species (Hymenoptera: Formicidae). *Myrmecological News*, 24: 83-89. [https://doi.org/10.25849/myrmecol.news\\_024:083](https://doi.org/10.25849/myrmecol.news_024:083).
- Janicki, J., Narula, N., Ziegler, M., Guénard, B. & Economo, E.P. (2016). Visualizing and interacting with large-volume biodiversity data using client-server web-mapping applications: The design and implementation of antmaps.org. *Ecological Informatics*, 32: 185-193. <https://doi.org/10.1016/j.ecoinf.2016.02.006>.
- Kallal, R.J. & LaPolla, J.S. (2012). Monograph of *Nylanderia* (Hymenoptera: Formicidae) of the world, part II: *Nylanderia* in the Nearctic. *Zootaxa*, 3508: 1-64. <https://doi.org/10.11646/zootaxa.3508.1.1>

- LaPolla, J.S. & Kallal, R.J. (2019). *Nylanderia* of the world part III: *Nylanderia* in the West Indies. *Zootaxa*, 4658: 401-451. <https://doi.org/10.11646/zootaxa.4658.3.1>
- LaPolla, J.S., Hawkes, P.G. & Fisher, B.L. (2011). Monograph of *Nylanderia* (Hymenoptera: Formicidae) of the world, part I: *Nylanderia* in the Afrotropics. *Zootaxa*, 3110: 10-36. <https://doi.org/10.11646/zootaxa.3110.1.1>
- Marazzi, B., Rossi-Pedruzzi, A., Giacalone-Forini, I. & Maspoli, G. (2014). Ant-Plant Interactions between Native Ants and Non-Native Plants with Extrafloral Nectaries: New Insights from the Brissago Islands (Canton Ticino, Switzerland). *Bollettino della Società Ticinese di Scienze Naturali*, 102: 47-56.
- Okonechnikov, K., Golosova, O., Fursov, M. & the UGENE team (2012). Unipro UGENE: a unified bioinformatics toolkit. *Bioinformatics*, 28: 1166-1167. <https://doi.org/10.1093/bioinformatics/bts091>
- Pronini, P. (1989). Les Macroarthropodes de l'Île de Saint' Apollinaire (Isole di Brissago – Lago Maggiore), partie I: Inventaire de la faune épigée. Travail de diplôme, Université de Neuchâtel, 50 pp.
- Ratnasingham, S. & Hebert, P.D.N. (2007). BOLD: The Barcode of Life Data System (<http://www.barcodinglife.org>). *Molecular Ecology Notes*, 7: 355-364. <https://doi.org/10.1111/j.1471-8286.2007.01678.x>
- Schär, S., Sommerhalder, J., Ungricht, S., Dimitrova Schär D. & Neumeyer, R. (2023). Neue Nachweise von Ameisen in der Schweiz. *Entomo Helvetica*, 16: 31-38.
- Sheard, J.K., Sanders, N.J., Gundlach, C., Schär, S. & Larsen, R.S. (2020). Monitoring the influx of new species through citizen science: the first introduced ant in Denmark. *PeerJ*, 8: e8850
- Smith, F. (1874). Descriptions of new species of Tenthredinidae, Ichneumonidae, Chrysididae, Formicidae of Japan. *Transactions of the Entomological Society of London*, 1874: 373-409.
- Seifert, B. (2020). Superkoloniale Ameisen nördlich der Alpen – eine Welle rollt an. *Pest Control News*, 69: 18-22.
- Wetterer, J.K. (2011). Worldwide spread of the yellow-footed ant, *Nylanderia flavipes* (Hymenoptera: Formicidae). *Florida Entomologist*, 94: 582-587. <https://doi.org/10.1653/024.094.0323>
- Wetterer, J.K. (2015). Geographic origin and spread of cosmopolitan ants (Hymenoptera: Formicidae). *Halteres*, 6: 66-78.
- Williams, J.L. & Lucky, A. (2020). Non-native and Invasive *Nylanderia* Crazy Ants (Hymenoptera: Formicidae) of the World: Integrating Genomics to Enhance Taxonomic Preparedness. *Annals of the Entomological Society of America*, 113: 318-336. <https://doi.org/10.1093/aesa/saz039>

