JRC 141695

European Commission

SCIENCE FOR POLICY BRIEF

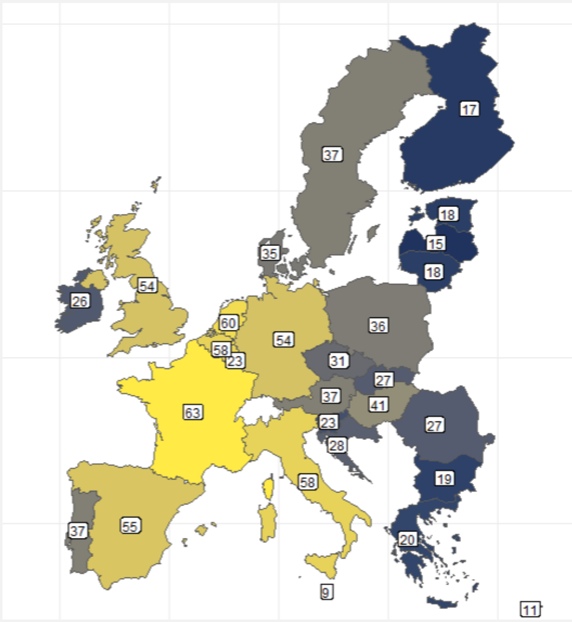
Preparing for biodiversity assessment: mapping invasive species' introduction dates

HIGHLIGHTS

→ Halting biodiversity loss includes reducing the introduction of invasive alien species (IAS) and minimising their impact.

→ 85 out of the 88 IAS of Union Concern (IAS of UC) are present in the European Union (EU). Data on IAS date of first introduction in the EU Member States (MS) is accessible through EASIN.

→ Country and date of first introduction of IAS of UC are key to assess IAS trends in time and space, and to monitor the implementation of EU policies.



OVERALL TRENDS

Introduction

Invasive alien species of Union concern (IAS of UC) pose significant threats to European Union (EU) biodiversity, the environment, economy, and human health. Regulation (EU) No 1143/2014[1] addresses the risks posed by IAS by fostering prevention, minimization, and mitigation of adverse impacts through key actions such as early detection, rapid eradication, management and information exchange. The analysis of IAS of UC first introduction events across the European Union's borders provides the opportunity to evaluate the effectiveness of the implementation of the IAS Regulation, transnational collaboration and early warning systems [1]. It also gives the chance to reflect on the surveillance systems operated by Member States (MS) to prevent, respond to new introductions and manage IAS of UC in a coordinated and effective manner. In the international context, the establishment of first introduction events enables countries to monitor and report on their commitments to global targets (Kunming-Montreal Global Biodiversity Framework-Target 6[2]).

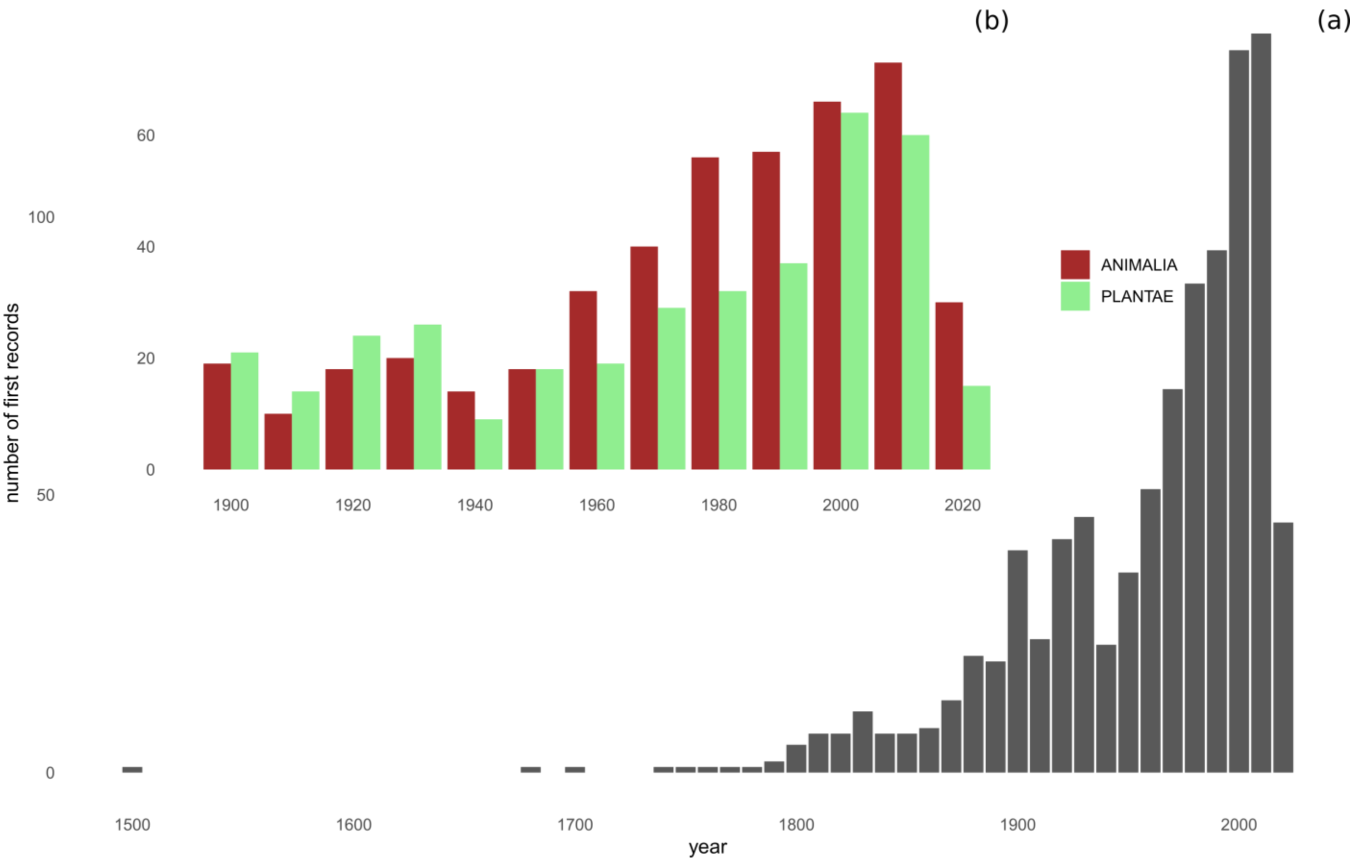
[1] Regulation (EU) No 1143/2014 of the European Parliament and the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species. OJ L 317, 4.11.2014, p. 35–55

[2] https://www.cbd.int/gbf/targets/6#:~:text=Eliminate%2C%20minimize%2C%20reduce%20and%20or,the%20rates%20of%20introduction%20and

Joint Research Centre

This brief provides dates on first introduction of the 85 species of UC currently present in the EU (out of 88 listed[3],[4],[5],[6]), and information on their pathways of introduction, as classified by the Convention on Biological Diversity (CBD) [2]. The analysis builds upon the data recorded in the European Alien Species Information Network (EASIN), which include official early warning notifications from MS through NOTSYS and baselines, the review of literature records (EASIN Lit) and, records in other databases (e.g. GBIF, etc.). Data is available through the search and service tools of EASIN.

Figure 1 – (a) Temporal distribution of first introduction records of IAS of UC in the EU. (b) Inset from 1900 to 2024 for the animal and plant groups.



Source: own elaboration.

Temporal and geographical patterns in the EU

After 1800, the rate of first introduction records of IAS of UC in the EU has shown substantial variability over the decades (Figure 1a). From 1970 to 2000, the rate of introductions initially increased, with a growth of 27.5% from 1970-1979 to 1980-1989. This was followed by a further increase of approximately 6.8% between 1980-1989 and 1990-1999. The number of introductions then increased by 38.3% from 1990-1999 to 2000-2009. In the following decade, there was a modest increase, with new introductions from 130 in 2000-2009 to 133 in 2010-2019. Between 2020 and 2024, there have been 45 new introduction records (Figure 1a). While the rate between 2000 and 2019 increased slightly, i.e. 2.3%, this period showed the largest contrasting pattern between animals and plant species, a decrease and an increase respectively (Figure 1b). The temporal increase (between 1970-2019) in the introduction and the number of MS affected suggests that factors such as increased trade, and possibly environmental changes might have facilitated the introduction of new species across a wider geographical area (Figure 2). Over the last four years, the number of introductions is approximately half of the previous decade total. This makes it challenging to infer whether the efforts in preventing new

[3] Commission Implementing Regulation (EU) 2022/1203 (OJ L 186, 13.7.2022, p. 10–13).

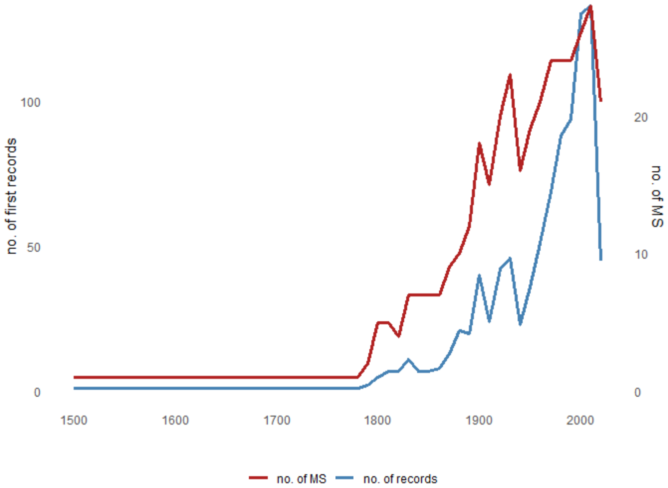
[4] Commission Implementing Regulation (EU) 2019/1262 (OJ L 199, 26.7.2019, p. 1).

[55] Commission Implementing Regulation (EU) 2017/1263 (OJ L 182, 13.7.2017, p. 37).

[6] Commission Implementing Regulation (EU) 2016/1141 (OJ L 189, 14.7.2016, p. 4).

introductions (e.g. enhanced international cooperation, the implementation of stricter regulations, or other socio-economic factors) have effectively limited the spread of IAS (Figure 2).

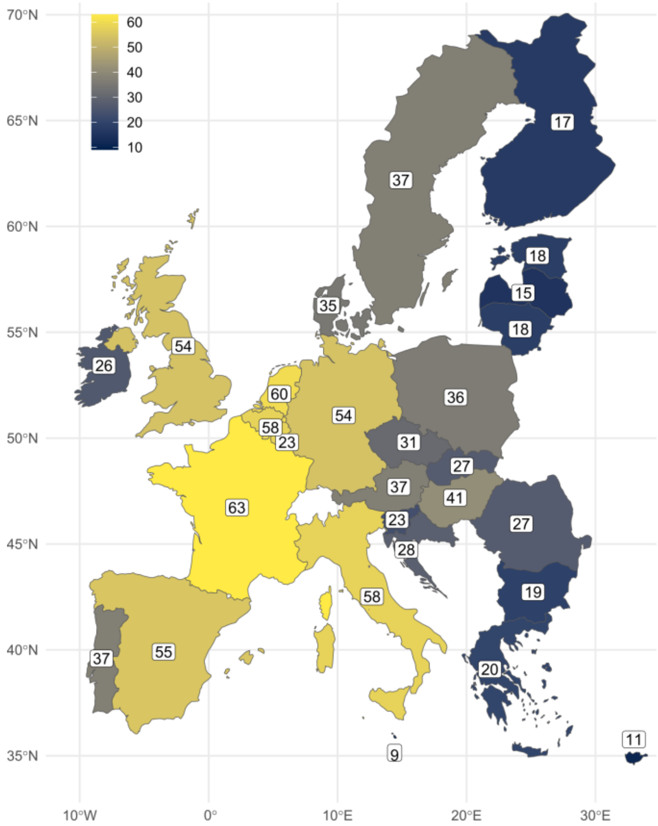
Figure 2 – Temporal distribution and geographical spread of first introduction records of IAS of UC across Member States (MS), grouped by decade from 1500 to 2024. Note: the last decade covers 4 years.



Source: own elaboration.

The map depicting the total number of first introductions of IAS of UC across the EU shows that France, the Netherlands, Belgium and Italy are hotspot countries, each reporting between 58 and 63 species (Figure 3). Smaller or geographically isolated countries such as Malta, Cyprus, and Estonia report significantly fewer introductions, between 9 and 18 (Figure 3), while Germany, Spain, Austria, and Sweden show moderate levels of introduction, with figures between 37 and 55 species (Figure 3).

Figure 3 – Map of the total number of first introductions for the 85 IAS of UC present in the EU by MS.[7]



Source: own elaboration.

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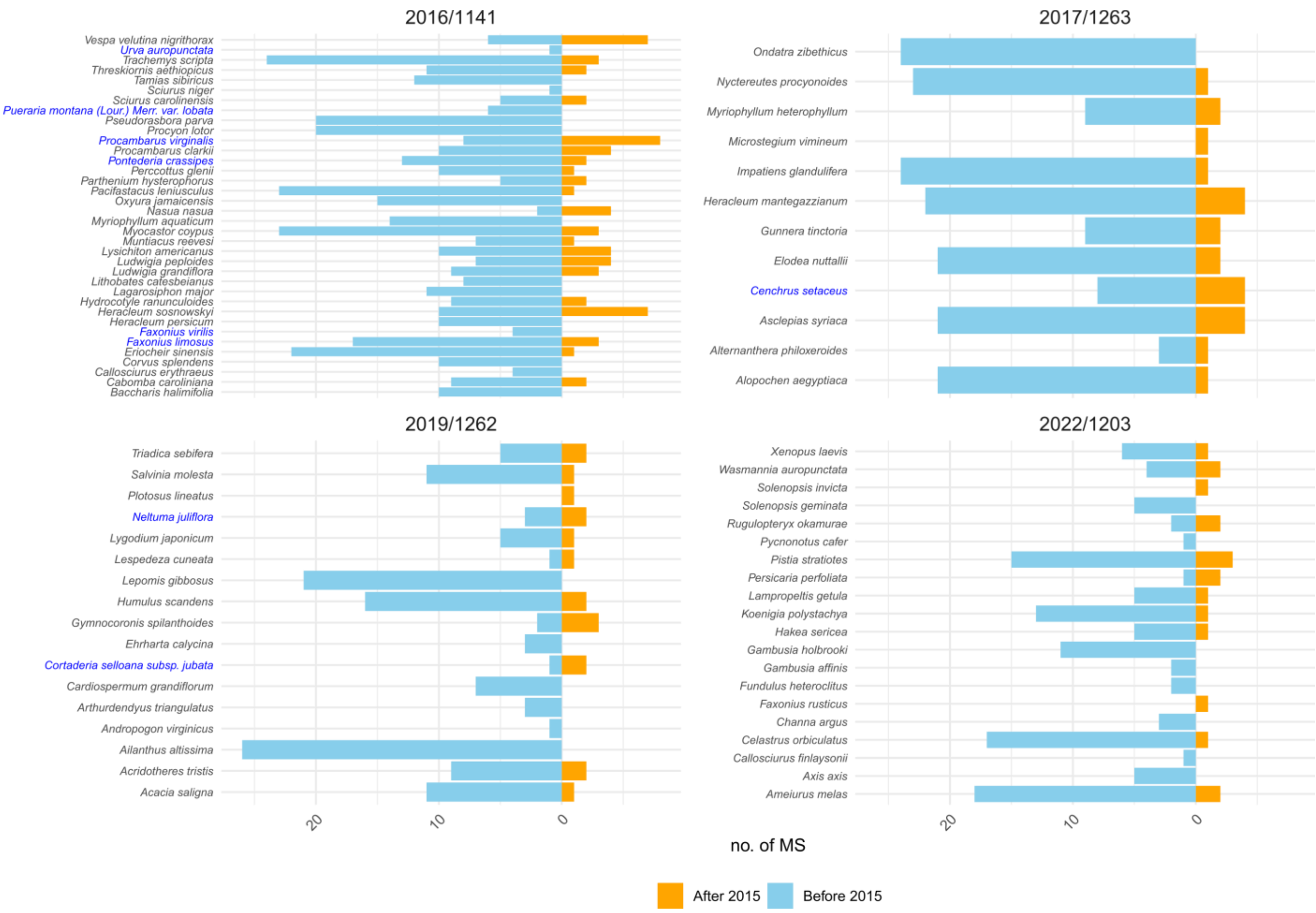
[7] After an introduction, eradication measures could have been put in place and some IAS might no longer be present in a MS.

13% of IAS of UC have been introduced to additional EU countries since 2015 (year of entry into force of the IAS regulation) (Figure 4). The species that have expanded their geographical distribution to new countries are: *Vespa velutina nigrithorax, Nasua nasua, Sciurus carolinensis, Gymnocoronis spilanthoides, Rugulopteryx okamurae, Cortaderia jubata, Persicaria perfoliata, Faxonius rusticus, Microstegium vimineum, Plotosus lineatus, Solenopsis invicta* (Figure 4).

Figure 4 – Number of IAS across countries before and after the entry into force of the IAS Regulation "*" (1 Jan 2015). At the top of each plot, the Implementing Regulations that updated the list of IAS of UC over the years are indicated. In blue IAS that have changed scientific nomenclature with respect to the name in the IAS Regulation.

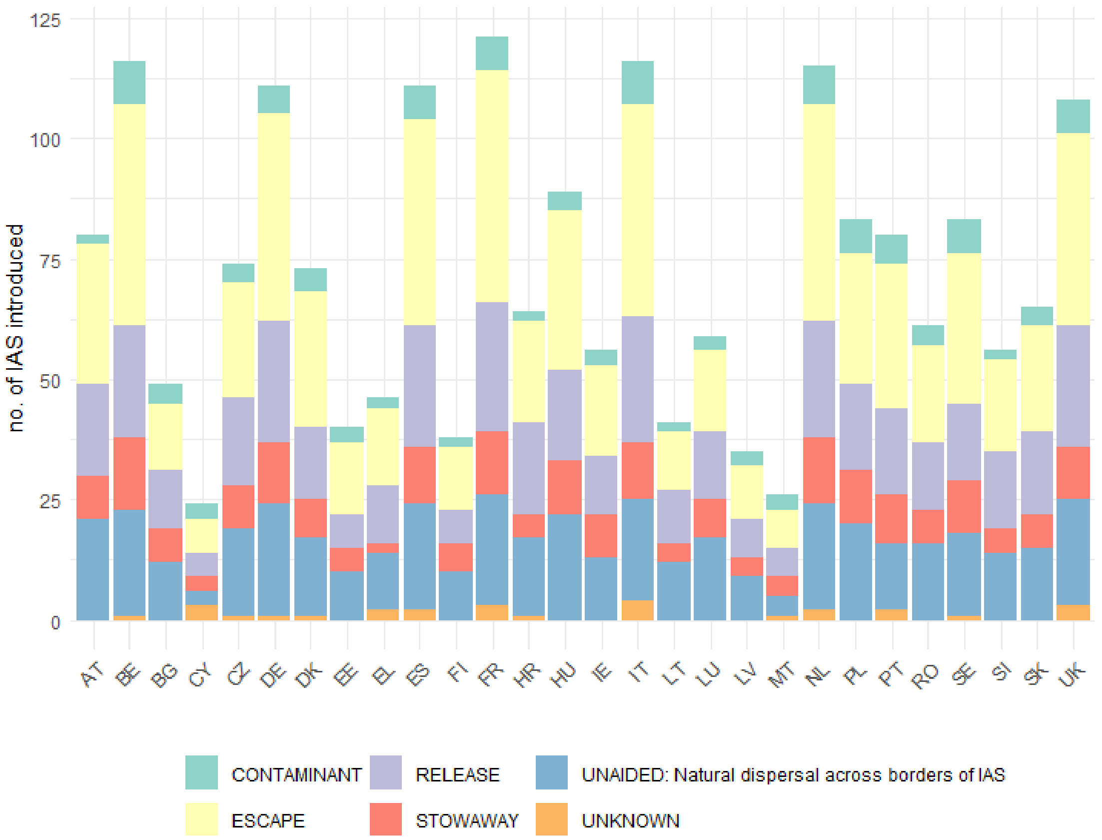


Source: own elaboration.

Pathways of introduction

Escape, Release and Natural dispersal are the most common pathways of introduction across MS. Escape from multipurpose breeding sites, i.e. horticulture, zoos, etc., is one of the common ways for the introduction of IAS [3]. Belgium, England, France, Italy, Germany, the Netherlands and Spain recorded the highest values of escapes (Figure 5). In these countries there has been an increase in breeding and trade of alien species over the years, leading to a greater probability of their escape. Intentional release into the wild for hunting, biological control, etc. played a role especially at the beginning of the last century (1900) [4], and natural dispersal beyond species boundaries (unaided) might be the result of introductions from adjacent countries, facilitated by new climatic conditions.

Figure 5 –Number of introduced IAS of UC by pathways across MS.



Source: own elaboration.

KEY CONCLUSIONS

- First date of introduction in EU MS of 85 IAS of UC have been revised and are accessible through EASIN.
- Monitoring the first introduction events is crucial for evaluating the effectiveness of transnational collaboration and early warning systems. This is essential for ensuring that MS can manage and respond to new introductions effectively.
- Since the IAS Regulation entry into force, IAS of UC have extended their distribution to other MS, indicating challenges in their management (e.g. control of introduction pathways).
- First introduction dates will support analyses and the evaluation of the achievement of the CBD targets on IAS across Europe, enhancing the EU ability to assess the effectiveness of the measures implemented and improve biodiversity management strategies.
- Data availability and timely data sharing are important for strengthening international collaboration and adopting swift and coordinated management measures.

REFERENCES

[1] Magliozzi, C., Lucrezi, S., Oficialdegui, F. J., Gervasini, E., Melone, B., & Cardoso, A. C. (2024). Transnational cooperation in EU: opportunities for addressing invasive alien species. *Management of Biological Invasions*, *15*(4).

[2] CBD. Pathways of introduction of invasive species, their prioritization and management (Secretariat of the Convention on Biological Diversity Montreal, 2014).

[3] Arianoutsou, M., Bazos, I., Christopoulou, A., Kokkoris, Y., Zikos, A., Zervou, S., ... & Tsiamis, K. (2021). Alien plants of Europe: introduction pathways, gateways and time trends. *PeerJ*, *9*, e11270.

[4] Biancolini D., Vascellari V., Melone B., Blackburn T. M., Cassey P., Scrivens S. L., Rondinini C. (2021) DAMA: the global Distribution of Alien Mammals database. Ecology, DOI: https://doi.org/10.1002/ecy.3474.

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DATA AVAILABILITY

EASIN Species Search
JRC Data Catalogue

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