

DAISIE: Delivering Alien Invasive Species Inventories for Europe

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The European Commission, under its Sixth Framework Programme, launched a call for an inventory of alien invasive species. The successful application was awarded to a consortium of leading researchers of biological invasions in Europe, drawn from 18 institutions across 15 countries. The resulting project, DAISIE (Delivering Alien Invasive Species Inventories for Europe), was launched in February 2005 and ran for three years.

The general objectives of the project were:

- To create an inventory of all known alien species in the European terrestrial, freshwater and marine environments.
- To describe the most important key alien species known to be invasive in Europe and to assess their ecological, economic and health risks and impacts.
- To compile a directory of experts and of research on alien species.

The information compiled by the DAISIE project has served at the same time as an important scientific basis for the research groups working in the invasion section of the ALARM project.

The European Alien Species

Database, an inventory of all alien species known to inhabit Europe, represented the major activity in DAISIE and involved compiling and peer-reviewing national lists of fungi, bryophytes, vascular plants, invertebrates, fish, amphibians, reptiles, birds and mammals. Data were collated for all 27 European Union member states, and where these states had significant island regions, data were collated



Figure 1. Bay barnacle *Balanus improvisus*. Photo: S. Olenin.

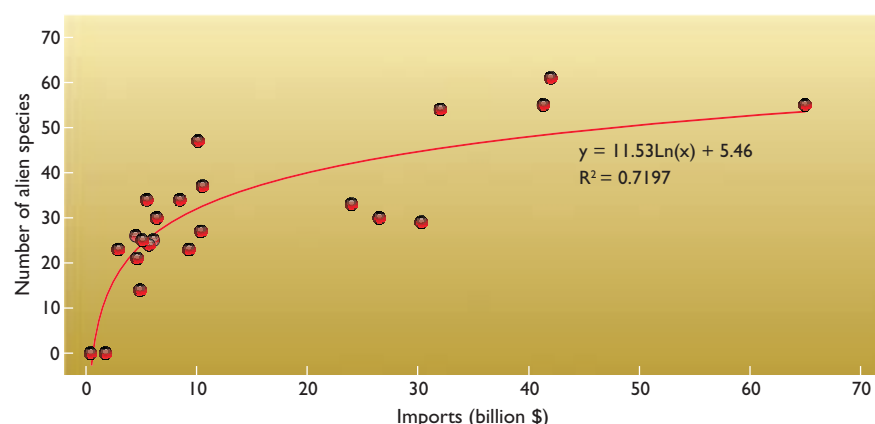


Figure 2. The relationship between the number of recorded alien fungi and the level of imports of goods in 2005 for European countries (OECD) suggests trade as an important vector for the increasing number of alien species (from Desprez-Loustau in DAISIE 2009).

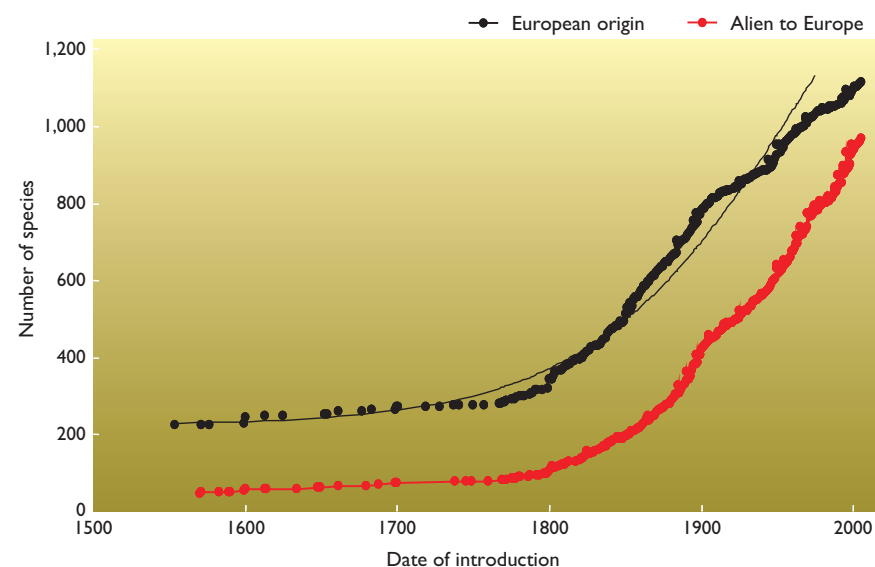


Figure 3. Increase in numbers of alien plants introduced to Europe over the last 500 years. Cumulative data are shown separately for species with native distribution area outside Europe and those with European origin, but occurring as alien in other parts of the continent (from Pyšek et al. in DAISIE 2009).



Figure 4. Japanese eel swim-bladder nematode *Anguillicola crassus*. Photo: D. Minchin.



Figure 5. Horse chestnut leaf-miner *Cameraria ohridella*. Photo: S. Augustin.

separately for these islands. In addition, data were collated for European states that are not in the European Union such as Andorra, Iceland, Liechtenstein, Moldova, Monaco, Norway, the European part of Russia, Switzerland, Ukraine as well as former Yugoslavian states in the Balkans. Finally, marine lists were referenced to the relevant maritime state and thus to have full coverage of the Mediterranean, marine data were included for North African and Near East countries. In total, the database contains documented introduction records of alien taxa for 71 terrestrial and nine marine regions. For each species, an attempt was made to gather information on native range, date of introduction, habitat, known impacts and population status. Considerable effort was required to ensure synonyms were accounted for accurately. By February 2008, records of about 11,000 alien species were included in the database, the majority of records are for vascular plants (5,789 species) with invertebrates (2,477 species) also a significant component.

The **European Invasive Alien Species Information System** is a “one-stop-shop” for information on biological invasions in Europe. It provides accounts

of 100 of the most invasive alien species in Europe and each includes information on biology, ecology, distribution, impact and management, with references, links and images. These accounts deliver to end users relevant details for species identification and management but also help raise public awareness of the issue of invasions. The accounts cover three fungi, 18 terrestrial plants, 16 terrestrial invertebrates, 15 vertebrates, 16 inland and 32 marine aquatic species invading natural and semi-natural habitats.

Selection was based on ensuring a broad spectrum of life forms and functional types, a range of invaded ecosystems and clear examples of different impacts on European biodiversity, economy and health. A key requirement for the effective management of invasive alien species is the ability to identify, map, and monitor invasions in order to assess their extent and dynamics. The Common European Chorological Grid Reference System with the size of the mapping grid ca. 50 × 50 km was used to produce distribution maps. Data sources included European-wide and national atlases as well as regional checklists. For each species the known presence was plotted but areas where a species previously occurred

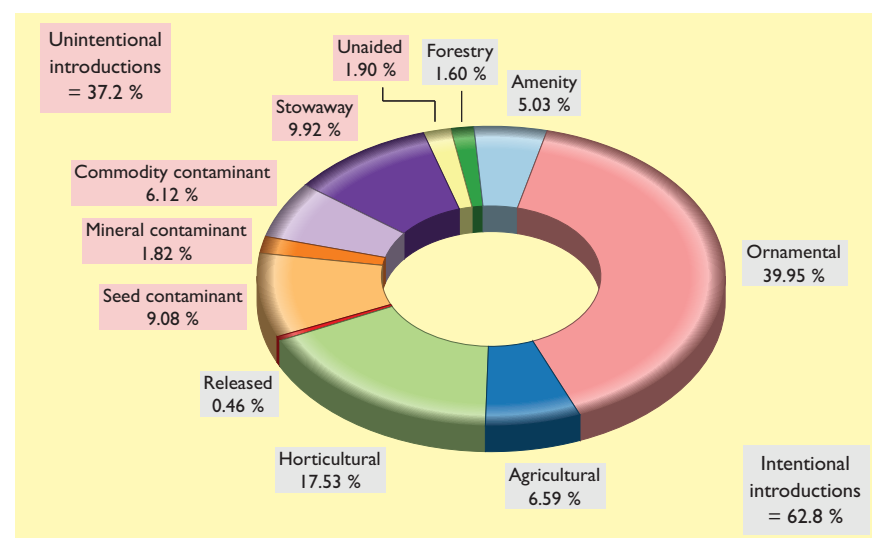


Figure 6. Relative contribution of pathways of introduction shown for alien plants with the area of origin outside Europe. Pathways of intentional introductions are in grey boxes, unintentional in pink (from Pyšek et al. in DAISIE 2009).



Figure 7. Himalayan balsam *Impatiens glandulifera*. Photo: P. Pyšek.

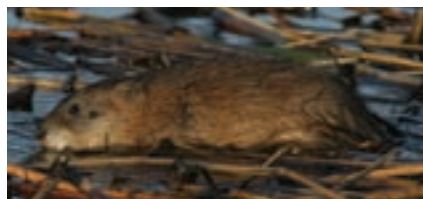


Figure 8. Muskrat *Ondatra zibethicus*. Photo: V.-M. Väänänen.

but was eradicated were also considered. Where precise information on distribution was missing but the species was known to occur in a country/region/district, the distribution in these administrative units was recorded and mapped by using hatching. A different format was adopted for mapping invaders in aquatic habitats where linear distributions or maritime areas were recorded.

The European Expertise Registry represents a fundamental step towards providing the critical mass of expertise in alien species research to meet European-scale requirements. The European Expertise Registry has enabled the current breadth and scope of European knowledge on alien species to be assessed for the first time. The registry contains information on the field of expertise (distribution, conservation, ecology, economy, genetics, legislation, management, pathways, physiology, risk assessment and taxonomy) and on the taxonomic and geographic structure of the expertise. As a result, the Registry facilitates both clustering and information-sharing among different national programmes targeting the same alien species, and in the future will help establish teams of experts who can, once a

new alien incursion has been reported, assess the situation and prepare an action plan for the alien species at a particular site. By the end of 2008 the Registry already contained information on 1,700 experts from more than 90 countries for over 3,400 higher taxa and numbers steadily increase.

Since February 2008, the DAISIE information system has been available at <http://www.europe-aliens.org>. Recently, the DAISIE information has been distilled in a **Handbook of Alien Species in Europe** (DAISIE 2009), which contains:

- Analytical chapters on alien fungi, bryophytes and lichens, vascular plants, terrestrial invertebrates, invertebrates and fish in inland waters, marine biota, birds, amphibians, reptiles, and mammals of Europe.
- A list of all species alien in Europe and to Europe.
- Species fact sheets of 100 of the most invasive alien species in Europe.
- A glossary of the main technical terms used in the inventory of alien species in Europe.



References

DAISIE (2009) Handbook of Alien Species in Europe. Springer, Dordrecht, 399 pp.

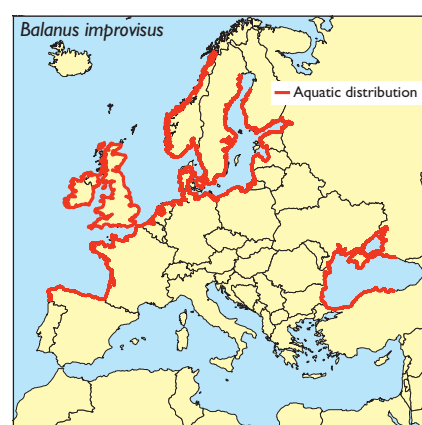


Figure 11. The invaded area of the North American bay barnacle *Balanus improvisus* (Balanidae, Crustacea), a fouling organism on blue mussels and oysters, water intake pipes and heat exchangers, underwater constructions and ships' hulls (DAISIE 2009).

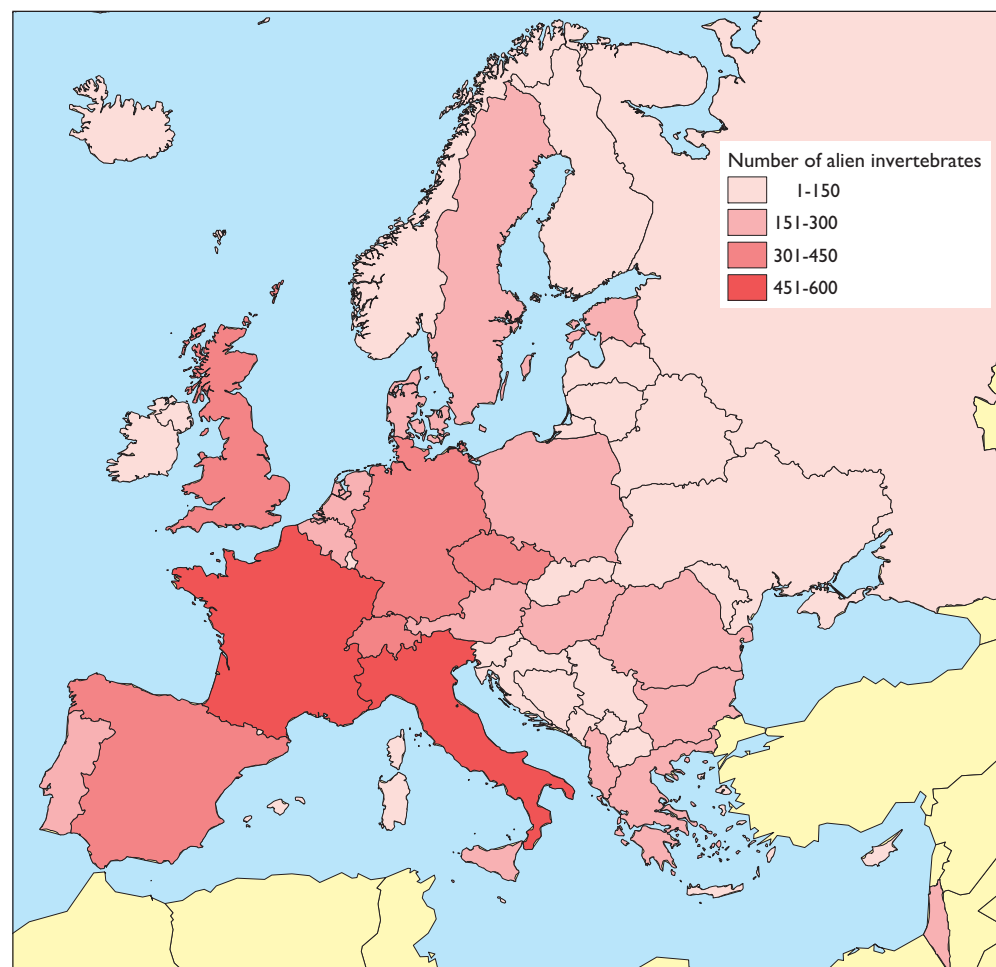


Figure 10. Numbers of alien invertebrates in European countries and regions. The Macaronesian islands (not shown) individually have from 163 to 203 alien species (from Roques et al. in DAISIE 2009).

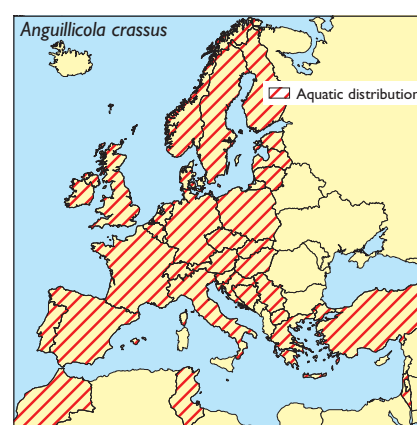


Figure 12. European distribution of the Japanese eel swim-bladder nematode *Anguillicola crassus* (Anguillicolidae, Nematoda), a parasite of the European eel (DAISIE 2009).

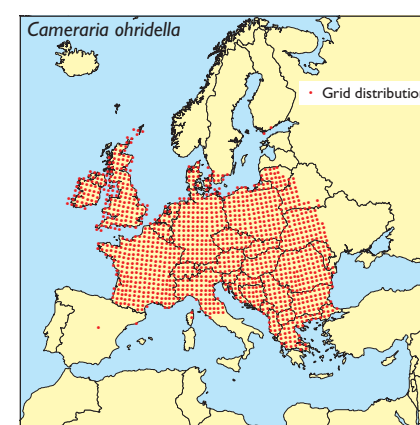


Figure 13. Invaded area of *Cameraria ohridella* (Gracillariidae, Lepidoptera) a leaf-mining moth which infests horse chestnut trees. Its aesthetic impact by damaging trees planted in cities and villages is raising significant public concern (DAISIE 2009).

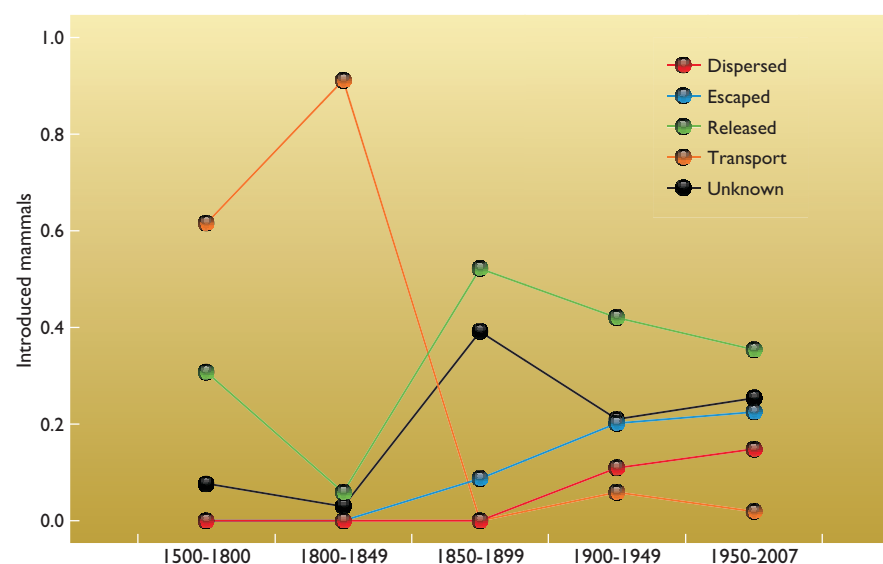


Figure 9. Changes over time in the role of major vectors responsible for the introduction of mammals in Europe (from Genovesi et al. in DAISIE 2009).

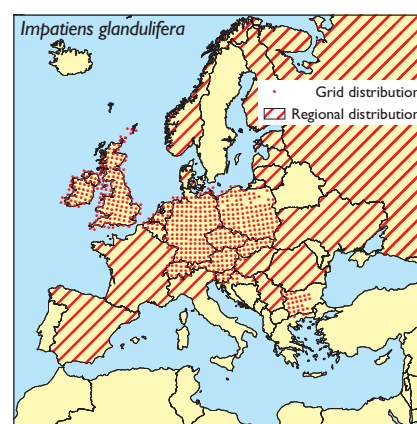


Figure 14. European distribution of the Himalayan balsam *Impatiens glandulifera* (Balsaminaceae, Magnoliophyta). It reduces the diversity of invaded communities, competes successfully for pollinators, and promotes erosion due to its modest root system (DAISIE 2009).



Figure 15. Distribution of the North American muskrat *Ondatra zibethicus* (Muridae, Mammalia) in Europe. It strongly affects vegetation dynamics through grazing, impacts endangered mussel populations, fish and ground nesting birds, damages riverbanks, railroads, dams and fences by burrowing, but also causes extensive damage to crops, irrigation structures and aquaculture industry (DAISIE 2009).