

A database of alien plants present in Sicily and Malta: a comparison between two close Mediterranean islands with a common management plan

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Acacia saligna was imported from Australand in sporadic sites, especially for hunting purposes in Malta, now representing between the 1930s and 1980s for reforestation of coastal dunes in Sicily a significant problem due to its invasiveness and the difficulties of eradication especially in natural habitats. It has replaced native flora in most areas it grows. Photos from the Simeto nature reserve near Catania (above) and from the island of Comino (a Natura 2000 Site) in the Maltese archipelago.

- The development of a common database of alien plant species present in Sicily and Malta is one important target of the FAST project funded under Interreg V-A Italia-Malta 2014-2020 call 2/2019. The project, in full coherence with European strategy for the protection of the biodiversity, will counteract the introduction, naturalization and spread of invasive alien species (IAS) that damage the natural and seminatural environments in Sicily and in Malta by means of:
 - their recognition and categorization within priority's scale;
 - their control and/or eradication in some Natura 2000 sites;
 - the identification and management of pathways and the means of introduction and dispersal;
 - the data processing of guidelines and adoption of best practices and
 - education and environmental awareness by several means of communication.
- Our work, has made it possible to create a common database of the alien plant species recorded from the two islands. Data was retrieved from both the scientific literature and from our own field studies. This made it possible to quantify the alien species reported so far for the two islands (more than 500 in Sicily and over 400 in Malta) as cryptogenic, casual, naturalized and invasive.
- The comparison between the alien plants present in Sicily with those present in Malta highlighted the fact that even though the habitats and the surface area are different (Malta 316 km² / 525,825 inhab., Sicily 25,832 km² / 4,789,826 inhab.) the number of alien species is high on both islands and many species are also in common to both. Some alien taxa invasive to Sicily have yet to arrive in Malta, hence the need to develop effective prevention strategies.
- Possible explanations of such high numbers for Malta almost comparable to those of Sicily are: the tendency for most of the alien species to concentrate at lower altitudes (see graphic), the highest number in the 0-100 m range (in Sicily); the very high population density; the long history of travel and different rulers on the islands each bringing their traditional plants or crops; the high intensity of tourism in the last decades; the high degradation of natural habitats such as agriculture and development; and elevated commercial import of ornamental plants (influenced by overpopulation). Finally, the small contained size of the islands and overpopulation act as a catalyst for the dynamic spread of propagules of alien species.
- Large urban centers such Palermo (Sicily) or Catania (Sicily), host a notable alien flora with comparable numbers and species and are often the first reporting sites for the settlement of a new alien species (Cambria et al. 2022).
- Using a prioritization scale, a small number of species that are mostly invasive or that potentially could become more invasive were chosen (about 150 for Sicily and 100 for Malta), in order to compile a complete datasheet for each of these species relating to origin, methods of diffusion, methods of containment or eradication. Many species are in common with the two islands but others could pass from one island to another and for this reason it is necessary to know in advance the methods and ways of spreading in order to prevent their naturalization



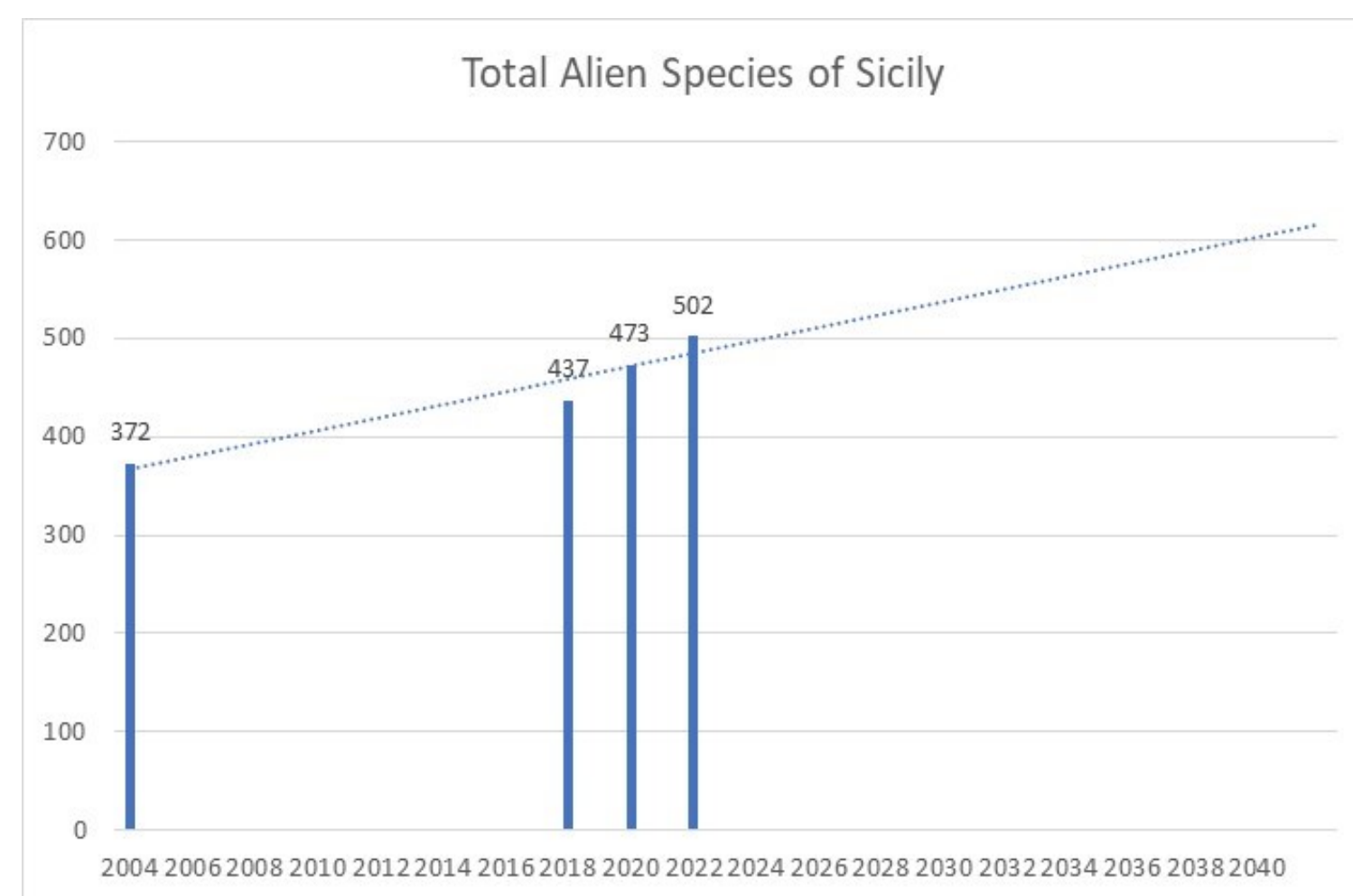
Allanthus altissima from China introduced about three centuries ago and now became widespread and invades abandoned areas of cultivation, edges of woods, and road infrastructures. From the Etna volcano and altitudes over 1000 m down to sea level, this species has become somewhat invasive in the last decades, here photographed on Etna close to Monte Ilice. Locally invasive in Malta in isolated but dense patches.



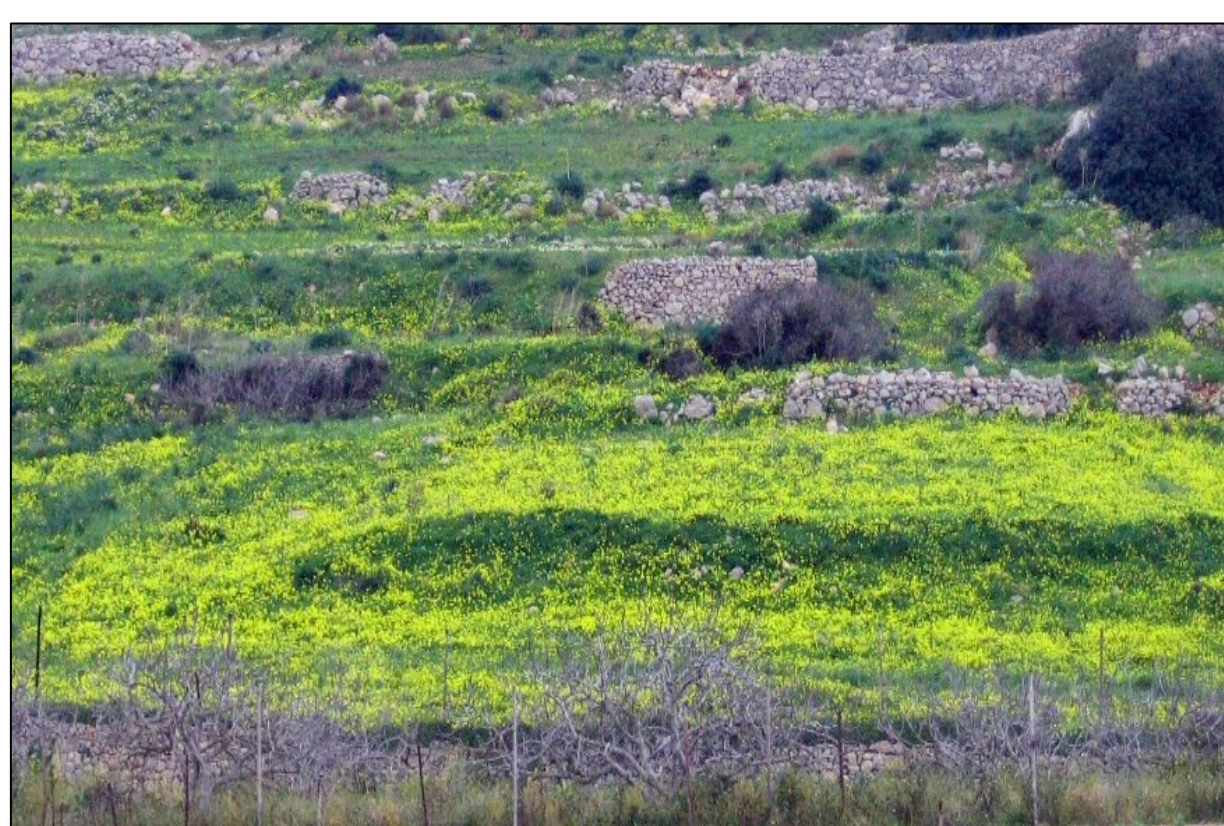
Agave americana from Central America was introduced in the early 20th century as an ornamental low-maintenance plant until it escaped in rural and seminatural areas giving rise to large invasive populations especially close to the coast. It is an extremely problematic species to remove for its huge and bulky size, tough armed leaves, irritating sap and deep roots into rocky ground. It is one of the exceptional plants that spreads viviparously, hence giving rise to new rooting plantlets held on 1-8 m tall flowering stems, which grow into individual plants, hence without need of seed dispersal and germination. It penetrated several natura 2000 sites including coastal cliffs such as at Ta' Cenc and Dingli, and the islands of Comino in Malta (photo from Pembroke) and _____ in Sicily.



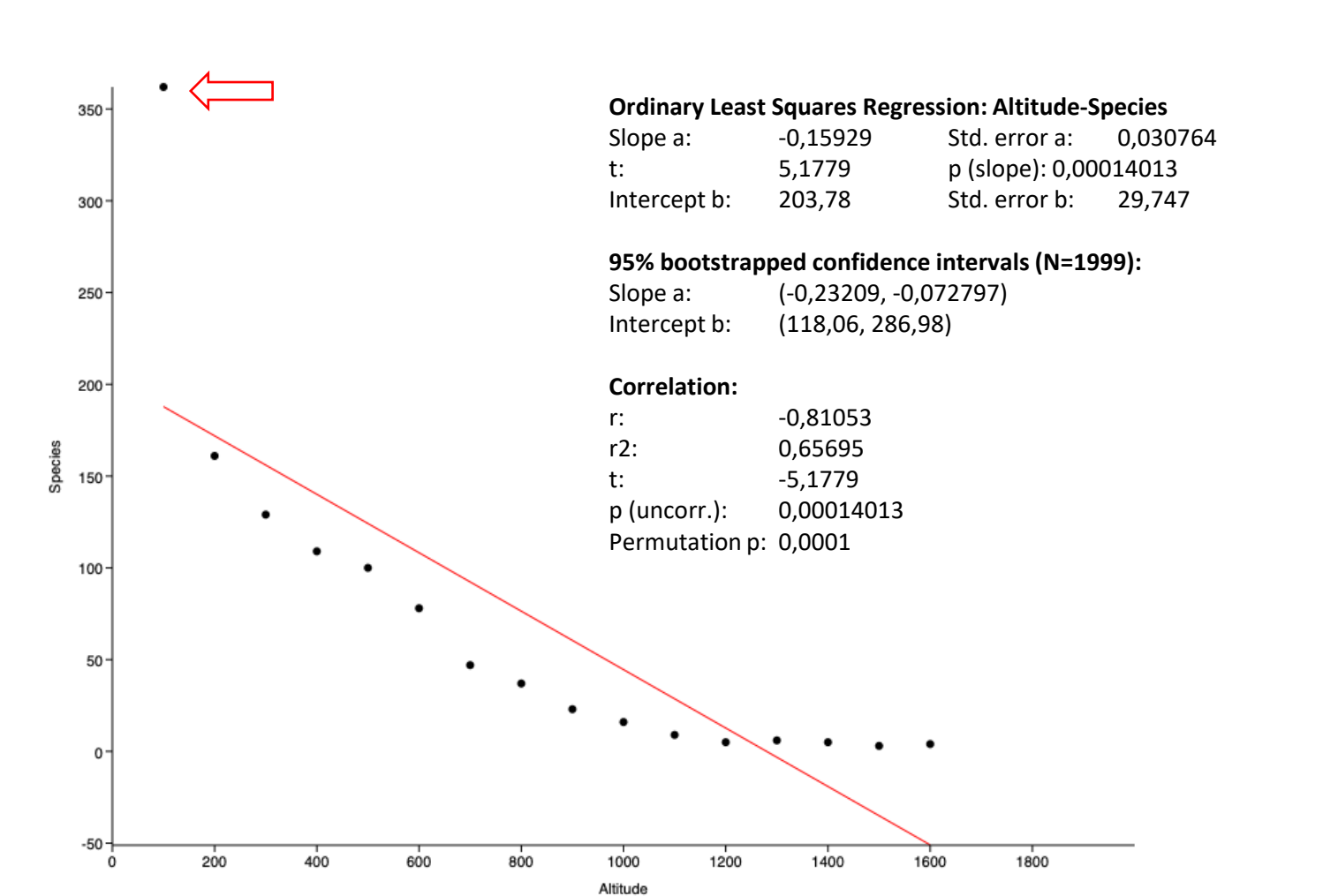
Boerhavia coccinea alien species of paleotropical origin reported in Palermo in 1967, later observed in eastern Sicily where it is invasive in uncultivated areas and roadsides; photographed here in 2020 at Capo Passero the southernmost tip of Sicily from here could reach Malta where it has not yet been observed but would have a considerable potential for spreading in that arid and hot territory



Graph of the total numbers of alien species surveyed for Sicily in recent years according to various authors (Domina et al. 2004, Galasso et al. 2018, Bartolucci et al. 2021, our database until today 2022). Although the sharply increasing numbers may depend on the increase in research on this topic, however, a constantly growing trend is undeniable. Same trend applies to Malta



Oxalis pes-caprae introduced in Malta from Cape Town (South Africa) at the beginning of the 19th century as an ornamental species and shortly after spread in Sicily and most of the Mediterranean region. In a very short time, it became a severe invasive species in both islands, mostly spreading by anthropogenic disturbances and water currents into natural environments. It is the most common species in the Maltese Islands, often found carpeting huge areas of steppe and clayey abandoned fields (photo left and bottom from Selmun) responsible for replacing many herbaceous native species; in Sicily it also forms dense areas, such as in coastal areas under *Tamarix africana* at the mouth of the Simeto River (photo right)



Number of alien plant species in relation to altitudinal bands at intervals of 100 m. The high number of species present between 0 and 100 m is evident, significant numbers up to 500-600m and relatively less numbers at altitudes higher from 800 m. This is best explained by the fact that most alien species have originated from warm tropical areas, mostly of horticulture, agriculture or medicinal use. Note that the Maltese Islands all the largest urban centers in Sicily are all coastal areas having a low altitudinal range, hence favouring the proliferation of alien species.



Pennisetum setaceum introduced from tropical Africa in the 30s of the last century in Sicily and in Malta about 20 years ago as a road embellishment plant, is one of the most problematic species in both islands as it has considerable invasiveness not only in urban areas but also in natural and semi-natural contexts such as the Mediterranean steppe meadows where it often wins the competition with native graminoid herbaceous species as seen in the photo above on Monte Pellegrino near Palermo or on the banks of the mouth of the Simeto River near Catania. In mainland Malta (bottom photo) it became very invasive in a matter of 15 years, but well-controlled in Gozo. It is among the species of Union interest for which prevention and containment action must be implemented as well as a ban on trade and introduction.

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