

Report on a project: GEISCA

A negative consequence of globalization is the increasingly frequent introduction of exotic pests into new areas. Italy is at high risk of such introduction, due to its geographical position and climate. The mechanisms involved in adaptation processes, crucial in studies of biological invasions, are known only in part. A continuous, joint effort is therefore needed, involving groups operating in Italy and abroad to counter this phenomenon. The research project GEISCA (Globalization Exotic Insects Sustainable Control Agroforestry ecosystems) was developed in this context. The project was specifically targeted towards sustainable control of introduced exotic insect species, in particular (but not exclusively) with regard to the natural control exerted on them by native beneficial arthropods. In fact, according to the "enemy release hypothesis", the initial success of non native species is also linked to a lack of adaptation to new hosts by native natural enemies. The insect species taken into consideration were all of great interest for crop and forest protection. At the beginning of the project activity (2013) some of these pests had already been established in Italy for some years and were causing significant damages to host plants and environment, whereas others, which had arrived more recently, needed to be studied in order to try to counteract their spread in an environmentally friendly manner. The list of insect species that have arrived recently from East Palearctic, Nearctic and Afrotropical regions is constantly increasing despite the quarantine procedures and strict controls. The specific objectives of GEISCA were thus diverse, depending on the starting situation considered for each insect pest.

Dryocosmus kuriphilus (Asian chestnut gall wasp - ACGW), of Chinese origin, was reported in Italy in 2002 and is still considered, worldwide, one of the most damaging pests of chestnut.

Tuta absoluta (South American tomato leafminer) was recorded in Italy in 2008 and is very harmful mainly to tomato crops. For both species, the goal was to increase knowledge on new associations with native natural enemies in different areas of Italy. A clarification on the systematic position of the more frequent hymenopterous parasitoid species of these target pests was also foreseen. For ACGW, an objective was to carry out research on the relationship between the exotic introduced parasitoid *Torymus sinensis* and native parasitoids.

Drosophila suzukii (Spotted Wing Drosophila - SWD), an invasive species of Asian origin first recorded in northern Italy (Trentino) in 2009, is now widespread in most Italian regions. SWD is harmful to ripening fruit of many cultivated and wild plants. For this pest, the aim was to start investigating possible associations with native entomophagous species and, when found, to study their biology and rearing techniques. Another goal was the iden-

tification of attractants for SWD sampling and control.

Two xylophagous species were studied, namely the long horn beetles *Anoplophora glabripennis* (in Italy since 2007) and *Psacothea hilaris hilaris* (recorded in 2005). The aim was to study the complex of native parasitoids associated with the two exotic species and their role in their sustainable control. The study of interactions with native parasitoids was the goal of the research involving the leaf miner moths *Phyllocnistis vitegenella*, *Antispila oinophylla* and *Coptodisca lucifluella*. For the latter, the aim was also to identify species using an integrated approach (morphological and bio-molecular).

With regard to the lady bird beetle *Harmonia axyridis*, an active predator of aphids of Asian origin, no longer commercialized in Europe due to its possible invasiveness, the aim was to increase knowledge about the interactions with indigenous parasitoids and to study factors (temperature, selectivity of insecticides) influencing its spread into new areas.

About not native thrips (already present or at risk of introduction), the objective was, on the one hand, to carry out samplings on their presence in citrus orchards in Calabria region, and on the other to evaluate the presence and the role of native parasitoids, and their identification, also through molecular methods.

For the eucalyptus psyllid *Glycaspis brimblecombei* (red gum lerp psyllid), the goal was to define the complex of its native enemies and their role as natural control agents, with particular reference to the exotic parasitoid *Psyllaephagus bliteus* found in 2011 as a fortuitous introduction in Italy.

Other newly introduced and established insects (e.g. *Thrips hawaiiensis*), studied with regard to their biology and sustainable control methods, were also added to the list as the GEISCA project progressed. The overall goal was to have, at the end of three years, useful knowledge on the biology and development of appropriate procedures for eco-friendly approaches to monitoring and reducing the populations of these target exotic insect species.

The papers published in international journals and proceedings following the support of GEISCA are listed in the supplemental material.

I am pleased to thank all the participants that produced interesting papers and with good international impact, some of which have just recently been published. A particular thanks to my colleague Maria Luisa Dindo who helped me, not only in an obvious scientific collaboration but also in red tape work and coordination.

Stefano Maini
GEISCA Project coordinator



Research Units:

Alma Mater Studiorum - Università di **Bologna**
Università degli Studi di **Catania**
Università degli Studi di **Milano**
Istituto per la Protezione Sostenibile delle Piante (CNR) **Portici**
Università degli Studi di **Padova**
Università Mediterranea di **Reggio Calabria**
Università degli Studi di **Torino**